ADVANCING THE STUDY OF PRIVATE LANDOWNER BEHAVIOR: UNDERSTANDING EARLY SUCCESSIONAL FOREST HABITAT MANAGEMENT

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Wildlife conservation plans for the northeastern U.S. call for engaging private landowners in early successional forest habitat conservation; yet, corresponding social science research to understand landowner behavior is not available. In response, my dissertation advances understanding of landowner willingness to engage in even-aged management, which is often prescribed to create ESH. I applied the social psychological Reasoned Action Approach (RAA), along with typologies, to understand landowner behavior and suggest an effective approach to engage landowners. My research was based on a survey of landowners with 10 acres or more (n=1036) in the Southern Tier region of New York State, conducted in 2010-2011. The survey measured landowners' intentions to cut patches of trees of at least ½ acre and allow the cut areas to regenerate into ESH. I assessed the predictors of landowners' behavioral intentions according to the RAA. Further, I applied these cognitions, along with landowner motivations, to create, critically assess, and compare three distinct typologies for understanding the breadth of landowners. Finally, I explored whether types of landowners within each of the typologies would be likely to change their behavioral intentions with the application of learning, financial, or social tools. My results show that strategies to engage landowners in even-aged management for ESH will have the greatest likelihood of success if they focus on influencing attitudes and their associated beliefs, possibly focused on members of game wildlife organizations. Additionally, a behavior-based typology might be most useful for practitioners

when determining how to reach out to different types of landowners; yet, I found that across all landowner types and typologies, learning tools were most likely to influence landowners' intentions to patch-cut, limiting the current need for different tools for different typologies. Only Continuing adopters would be influenced similarly by learning tools and basic needs tools. I detail the conservation applications of this work for conservation agencies, organizations, and initiatives, as well as the theoretical and methodological advancements for researchers.

BIOGRAPHICAL SKETCH

Ashley Dayer was born in Washington, D.C. and spent the first years of her life in Falls Church, Virginia. Her parents tired of the fast-paced city life and moved to East Aurora, a small town in western New York, where her father had been raised. At their country home on a hill overlooking Lake Erie, Ashley and her two younger brothers spent many days playing in the woods, their pool, and around their neighbor's pond. In these woods, along with summer vacations to the ocean and mountains, and three summers of marine biology camp, Ashley developed a connection to the outdoors and wildlife. For her senior project at Nichols Upper School she compared bird rehabilitation facilities locally with the Suncoast Seabird Sanctuary in Florida –the beginning of her work with birds.

Ashley graduated with a B.A. with Honors in Environmental Science and Public Policy from Harvard University (2001). Her undergraduate thesis focused on whale and seabird utilization of a tidal rip in Grand Manan, New Brunswick. During and after college she worked in marine and wildlife biology positions on both coasts of the United States and Canada. Her interests in environmental education and human dimensions formed from observing unaddressed conservation challenges for the wildlife that she studied. After several years creating education and outreach programs, she was drawn to pursue graduate work in human dimensions to consider what perplexed her the most: *how are human attitudes and behaviors related to wildlife conservation formed and changed?* At Colorado State University, Ashley obtained her M.S. in Human Dimensions of Natural Resources (2006), studying the wildlife values of the Western public. Ashley then served as the Education and Outreach Director for Klamath Bird Observatory where she developed her bird and habitat conservation approach that includes human dimensions and education, outreach, and communications, working in collaboration with ecological scientists.

In 2009, Ashley returned to New York to pursue her doctorate in Natural Resources and work with the Cornell Lab of Ornithology on bird conservation. As she again ventured into the woods of New York, they were both familiar and foreign. She felt comfort returning to the

deciduous trees, shrubs, and songbirds of her childhood but oddly disoriented as a conservationist who had spent her time in terrestrial systems in the West. Through her graduate studies and Land Grant fellowship, Ashley enjoyed reacquainting herself with her roots and the people who lived here. She soon found herself living in a country home, on a hill, above Skaneateles Lake. Here, she and her husband, Ron Meyers, began an organic farm, raising vegetables and chickens and promoting local, sustainably grown foods in their community. When Ashley was not working on her dissertation or digging in the soil, she biked the roads of the Finger Lakes or flew off to bird conservation meetings in her roles at the Cornell Lab and her conservation consulting business. With her Ph.D., she looks forward to continuing to work with conservation organizations and initiatives to improve their conservation impacts by more effectively engaging people.

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Supportive advisors are key to a positive graduate school experience; I am thankful that I found two such advisors with complementary skillsets who worked so well together and with me. Drs. Shorna Broussard Allred and Richard Stedman dedicated many hours to reviewing my work, and they afforded me many opportunities to lead research and extension activities. Most importantly, they understood my passion for bird conservation and my dedication to continuing professional work in this area, even though it took me away from my research for many weeks each year. I worked closely on these conservation initiatives with Dr. Ken Rosenberg. In addition to serving as my mentor in bird conservation, he brought a unique and critical emphasis on conservation application to my dissertation committee, for which I am very grateful. Additionally, Dr. Angela Fuller aided in enhancing my understanding of ecological components of conservation science.

I also appreciate the involvement of Drs. Dan Decker and Jody Enck of the Cornell University Human Dimensions Research Unit and Mark Kandel, Mike Wasilco, Paul Novak, Tom Bell, and Matt Swayze from New York State Department of Environmental Conservation, who served as the Contact Team for this research. Additionally, Karlene Smith and Nancy Connelly from the Cornell University Human Dimensions Research Unit aided me greatly in survey implementation. Several hard-working and dedicated Cornell University students also contributed to my research: Chad Johnson, Laura Wetzel, Christine Moskell, Margaret Kurth, and Audrey Denvir. I also greatly appreciate the time of the professionals and the landowners who responded to my interview requests and my surveys.

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I am forever indebted to my parents who supported my desire to learn and receive the most rigorous education possible for 19 years. This strong educational background, from preschool through private high school and an Ivy League undergraduate degree, laid the foundation for my subsequent nine years in graduate degree and business certificate programs.

Finally, my husband, Dr. Ron Meyers, deserves my sincerest appreciation. He started encouraging me to return to school and complete my Ph.D. the night we met in 2007 and debated wildlife values. Throughout the process of applying to Cornell, packing up and moving East, and the up's and down's of my graduate degree, he never waivered in his encouragement and support. Thank you.

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CHAPTER ONE: INTRODUCTION

Wildlife conservation plans often call for engaging private landowners in habitat conservation; yet, the corresponding social science research necessary to understand landowner behavior is rarely tied to these recommendations. Such a gap limits the effectiveness of conservation efforts in attaining habitat and wildlife species population goals called for in conservation plans (Balmford & Cowling, 2006; Knight et al., 2008; Sunderland, Sunderland-Groves, Shanley, & Campbell, 2009). Engaging private landowners is especially important for management of early successional forest habitat (areas with persistent shrubs or seedling-sized to sapling-sized trees that are typically a response to disturbance) in the Northeastern United States. Collaborative working groups and initiatives focusing on creating and maintaining early successional habitat (ESH) are prevalent, as are organization-specific efforts. Still, ESH and the species reliant on this habitat continue to decline throughout the Northeast (Dettmers, 2003; Fuller & DeStefano, 2003; Kjoss & Litvaitis, 2001; Latham, 2003; Litvaitis, 2001; Rosenberg & Burger, 2008). Conservation plans resulting from these ESH-related initiatives recommend forest management on private lands to create sufficient ESH to sustain wildlife populations. These plans often specifically reference the need for landowners to conduct even-aged management practices (e.g., clearcut or group selection) in their forests as the best way to create ESH conditions. Yet, few of these plans include any research about how to effectively engage landowners in order to achieve these goals in the current social context.

The scope of the ESH conservation issue clearly requires an understanding that extends beyond the biological and ecological science underlying conservation plans to also include human dimensions, or social science-based, inquiry. In response to this lack of attention to the human dimensions of ESH conservation, my dissertation advances our understanding of

landowner willingness to engage in even-aged management. Specifically, I apply the most recent iteration of a well-known theory developed by social psychologists Fishbein and Ajzen: the Reasoned Action Approach (RAA; Fishbein & Ajzen, 2010). Earlier versions of this theory have been applied in a variety of research settings to understand how cognitive elements predict human behavior. Such findings can then be applied to design targeted efforts for behavior change. The RAA has added value over earlier versions of the theory with its inclusion of additional individual and social variables that provide the context for, and that likely influence, an individual's rational thought and behavior. I extend the RAA further to consider the ecological as well as individual and social characteristics that have the potential to influence individual decision-making.

To this social-psychological line of research, I then tie a prevalent strand of research used to understand similarities and differences among groups of landowners: typologies. Typologies are classification systems used to order cases into groups based on their similarity (Bailey, 1994). Like research with the RAA, typology research can readily be applied to develop targeted approaches that engage landowners. Typologies typically define landowners based on their behavior (e.g., Tuttle & Kelley, 1981) or their motivations (e.g., Butler et al., 2007). My research compares a new typology developed using RAA concepts with more traditional approaches, thereby, highlighting the strengths and weaknesses of these approaches. The integration of RAA and more traditional approaches allows for a greater understanding of ways to effectively engage a breadth of landowners in forest management.

Finally, I explore how typologies relate to the likelihood that tools of public action (approaches that encourage action by members of the public to address a public problem) will encourage landowners to change their behavior. Integration of research from public policy brings

a history of empirically exploring public preferences for tools (e.g. Howlett, 2009) using a range of approaches, from financial to educational. My results provide guidance for agencies and organizations on *how* to encourage the breadth of landowner types to undertake ESH management.

My research incorporated both qualitative and quantitative phases. Interviews of professionals who specialize in research, outreach, or management of ESH (experts); interviews of landowners experienced in ESH management; and a focus group with landowners inexperienced in ESH informed a quantitative mail survey of a random sample of landowners who own more than ten acres. Data collection occurred from September 2009 to January 2011 and focused primarily on the Southern Tier region of New York State, which includes Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Cortland, Tioga, Broome, Chenango, Otsego, and Delaware counties. The survey measured landowners' behavioral intentions to cut patches of trees of at least ½ acre and allow the cut areas to regenerate into ESH. I assessed the predictors of landowners' behavioral intentions according to the RAA with items measuring attitudes, norms, perceived behavioral control, beliefs, and land and landowner characteristics. Further, I applied these cognitions, along with landowner motivations, to create, critically assess, and compare three distinct typologies for landowners. Finally, I determined whether landowners within each of the typologies would be likely to change their behavioral intentions with the application of learning, financial, or social tools.

Contents

This dissertation includes a series of three research papers, which have been or will be submitted to academic journals. Here, I briefly summarize each of these papers.

Chapter Two: The Social Psychology of Landowner Behavior: Understanding Intentions to Create Early Successional Forest Habitat

In this chapter I apply the Reasoned Action Approach from social psychology to predict the intentions of landowners in the Southern Tier of New York State to conduct patch-cuts, a type of even-aged management. I explore the role of the direct determinants of intention to cut patches (attitudes, norms, and perceived behavioral control), as well as associated beliefs. To this traditional application of the RAA, I add land and landowner characteristics, including the well-established predictor, past behavior. I utilize Bayesian Structural Equation Modeling for the analyses and discuss recommendations for applying these findings to develop education and outreach efforts for private landowners.

Chapter Three: A Comparative Analysis and Assessment of Forest Landowner Typologies Based on Behaviors, Motivations, and Reasoned Action Cognitions

I develop and compare typologies based on common sets of variables in landowner typology research (i.e., landowner behaviors or landowner ownership motivations) with a new kind of typology based on cognitions from the Reasoned Action Approach (i.e., attitudes, norms, and perceived behavioral control). To evaluate how this new reasoned action-based typology compares with two well-established typology approaches (motivations, behavior), I employ three methods of assessment: reliability through split-halves, predictive validity through external variables, and application of quality typology criteria. Most of these assessment techniques have rarely, if ever, been applied to landowner typologies. My assessment provides a more complete understanding of the strengths and weaknesses of three different kinds of landowner typologies and considers the implications selecting a particular typology to inform education, outreach, and communications with landowners.

Chapter Four: Developing Tools to Encourage Private Forest Landowner Participation in Early Successional Forest Habitat Management

I explore how landowner typologies (based on behavior, motivations, or cognitions from the Reasoned Action Approach) can be used to inform the selection of *tools of public action* for ESH management. Tools of public action are mechanisms and strategies employed by organizations or agencies to encourage people to engage in a behavior that addresses a public problem. While researchers assume that different types of landowners might prefer different types of tools, this assumption has rarely been tested empirically. This paper provides the first assessment of how landowner typologies can be used to identify which mix of tools of public action could most effectively engage different types of landowners in even-aged management. Based on landowner types' preferences for tools, I offer suggestions about the expected effectiveness of tools for engaging landowners in habitat management and how agencies and organizations might apply these findings in developing the tools for landowners.

Contributions of this Research

The unique contributions of this research include (1) the first exploration of the predictors of landowners' behavioral intention to cut patches of trees that could produce ESH, (2) the first comparison of social-psychological models for predicting landowner behavior in the context of land or landowner characteristics, and (3) the first application of Bayesian Structural Equation Modeling in forest-landowner research. Additionally, the contributions in terms of typology research include the first application of comprehensive quantitative and qualitative methods to compare the quality of landowner typologies, and the first empirical comparison of how to best use available tools to engage landowner types in forest management behavior. This dissertation also offers an expanded discussion on the implications of using social-psychological, typology, and tools of public action to guide approaches to engage landowners in management to achieve

habitat objectives called for in wildlife conservation plans.

The findings gained can better guide agencies and organizations interested in supporting landowners in managing for ESH and the ESH-reliant species on their lands, as well as researchers interested in better understanding landowner behavioral intentions and enhanced applications of typologies. More specifically, my research assesses landowners' willingness to conduct forest management that can create ESH, examines the cognitions and contextual (social and ecological) characteristics that explains this willingness, and suggests how to focus landowner engagement efforts. I critically evaluate landowner typologies, explore how different types of landowners might be encouraged to undertake forest management, and provide guidance for developing the most effective private lands programs for ESH conservation. The results of this study, based on survey research in a region of New York State, are partially reliant on the region of study and its particular social and ecological context. However, the theory applied, research approach undertaken, and methods used should be widely applicable to many different locations, landowner behaviors, and conservation issues.

Conclusion

This research develops and applies a model for understanding private landowners' behavioral intentions to cut patches of trees necessary to create ESH for wildlife species in decline. Further, it guides understanding of the differences of types of landowners related to this behavior and creation of the most effective efforts to engage those with a propensity to undertake the behavior. As such, this dissertation bridges the gap between ecologically based conservation goals and social science-based understanding of the context for implementing conservation goals. It further spans the divide between research and application, offering actionable suggestions to educators, outreach and communications specialists and private lands program

administrators.

Private landowners' behavior and needs are critical to consider for the study and conservation of other habitats as well: from the grasslands of the Prairie Potholes region, being rapidly converted to commercial agriculture and biofuels, to the disappearing Atlantic coastal marshes where marsh habitat must be allowed to migrate inland onto private lands in the face of rising sea level. In nearly all cases of habitat loss, social-science research with private landowners is necessary to assess their likelihood to engage in habitat conservation behaviors, to understand the breadth and diversity of landowners and how to best support those with an interest in conservation on their lands, and to develop tools to promote adequate participation in conservation action. Such research can provide critical guidance to those implementing conservation plans through engagement with private landowners.

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CHAPTER TWO: THE SOCIAL PSYCHOLOGY OF LANDOWNER BEHAVIOR: UNDERSTANDING INTENTIONS TO CREATE EARLY SUCCESSIONAL HABITAT

Abstract

Early successional forest habitat and associated wildlife in the Northeastern United States are currently in decline. Engaging private forest landowners in even-aged forest management can help create these forest conditions. I applied the Reasoned Action Approach from social psychology to predict the intentions of landowners in the Southern Tier of New York State to conduct patch-cuts, a type of even-aged forest management. I explored the role of the direct determinants of intention to cut patches (attitudes, norms, and perceived behavioral control), as well as associated beliefs. To this traditional model, I added land characteristics (amount of land owned, amount of mature forest, and amount of ESH) and landowner characteristics (membership in a game wildlife organization, residence status on land, past behavior). I tested the model's predictive ability using data from a mail survey of landowners. I found that 53% of respondents have an intention to conduct patch-cuts. Of the model's direct determinants, attitude was the strongest predictor of behavioral intention. Beliefs contributed indirectly to behavioral intention through the direct determinants. Landowner characteristics predicted beliefs better than land characteristics, with membership in an organization focused on wildlife species that are hunted being the most important characteristic for understanding beliefs. The relationship between the land and landowner characteristics and behavioral intention was fully mediated by beliefs and the direct determinants, with the exception of past behavior, which directly influenced behavioral intention in addition to beliefs and the direct determinants. My results suggest that patch-cutting intentions are most likely expressed by landowners who think the behavior is good for their land and wildlife, believe in positive outcomes of land and wildlife management, belong to a game wildlife organization, and have conducted patch-cuts in the past.

Strategies to engage landowners in early successional habitat management will have the highest likelihood of success if they focus on influencing behavioral beliefs and subsequently attitudes, possibly working with game wildlife organizations to communicate a unified message for habitat conservation.

Introduction

In the forests of the Northeastern United States, a wildlife conservation issue of great concern is the decline of early successional forest habitat and associated wildlife species (North American Bird Conservation Initiative, 2009; NYSDEC, 2006). Collaborative working groups and conservation initiatives focusing on this issue include the Golden-winged Warbler Working Group, Young Forest Initiative, New England Cottontail Recovery Team, Woodcock Initiative, as well as organization-specific efforts, such as those by state agencies and the Atlantic Flyway of National Audubon Society. Early successional forest habitats (ESH), also known as shrubland and young forest, are characterized by persistent shrubs or seedling-sized to sapling-sized trees that are typically a response to some form of natural and human-induced disturbance (Litvaitis, 2003).

Given the concern about ESH declines experienced in the Northeast U.S., forest management is sometimes promoted as a tool to create sufficient ESH to sustain wildlife populations that rely on this habitat (Brooks, 2003). Forest management activities can provide ESH in areas where there is no longer sufficient natural disturbance (e.g., fire, openings from beaver activity). Even-aged timber management (e.g., group selection, clearcutting, seed-tree, and shelterwood) is thought to be one of the most effective means for creating ESH (King, Degraaf, & Griffin, 2001; Costello, Yamasaki, Pekins, Leak, & Neefus, 2000). The suitability of specific ESH conditions for wildlife varies by species of wildlife and the age since harvest of the

regenerating forest. For example, some species of shrubland songbirds have highest abundance immediately following an even-aged timber harvest, while other species peak at ten years post-harvest (Schlossberg & King, 2009).

Forests are largely (83%) privately owned in the Northeast U.S. (Miles, 2013), leading most organizations and agencies interested in forest management for ESH-associated wildlife species to focus heavily on private landowners' actions. New York State, like other Northeastern states, has prioritized activities to increase the amount of ESH as stated in their Comprehensive Wildlife Conservation Strategies (CWCS) and State Wildlife Action Plans (NYSDEC, 2006). The New York State CWCS emphasizes the role of private landowners in ESH conservation, making the connection to a need for education and outreach:

> Perhaps the most serious threat to these habitats and the species that rely on them is the lack of adequate management ... Much of New York State's forestlands are in private ownership, making public outreach and education an important tool in addressing this threat (NYSDEC, 2006, p.58-59).

A lack of understanding of how private landowners make decisions to manage for ESH (Gobster, 2001) limits the effectiveness of private lands programs. In this paper, my goal is to develop a better understanding of the factors that influence private landowners' forest management for ESH. I apply survey research from New York State's Southern Tier to the Reasoned Action Approach, a well-known social-psychological model developed by Fishbein and Azjen (2010) with proven utility in understanding a variety of landowner behaviors. I extend this research by introducing landowner and land characteristics to the social-psychological constructs in the model. Such information can help guide efforts to support landowners interested in habitat conservation, by identifying the sources of landowner beliefs.

Literature Review

ESH and Associated Wildlife in Decline

ESH-reliant taxa in decline include plants (Latham, 2003), birds (Dettmers, 2003; Rosenberg & Burger, 2008), mammals (Fuller & DeStefano, 2003; Litvaitis, 1993, 2001); and reptiles (Kjoss & Litvaitis, 2001). Examples of such species include Golden-winged Warbler (*Vermivora chrysoptera)*, American Woodcock (*Scolopax minor*), New England Cottontail (*Sylvilagus transitionalis*), and other game and non-game species. Population declines for ESH-reliant species are especially well known for birds. According to the *New York Breeding Bird Atlas*, the greatest decline for ESH-reliant birds species from the early 1980s to the early 2000s is the Yellow-breasted Chat (*Icteria virens*) (-78% of atlas blocks occupied), followed by the Whip-poor-will (*Caprimulgus vociferus*) (-57%), and Golden-winged Warbler (-30%) (Rosenberg & Burger, 2008). These species are listed as species of Special Concern on the New York list of endangered, threatened, or special concern species and are also listed as Species of Greatest Conservation Need in the state. Also declining during the past two decades are the Brown Thrasher (*Toxostoma rufum*) (-30%), Northern Bobwhite (*Colinus virginianus*) (-26%), and Ruffed Grouse (*Bonasa umbellus*) (-18%), which are also Species of Greatest Conservation Need. Similarly, of the ESH-reliant boreal species that are Species of Greatest Conservation Need in New York, all but one are in decline, including Olive-sided Flycatcher (*Contopus cooperi*) (-34%), Spruce Grouse (*Falcipennis canadensis*) (-26%), Rusty Blackbird (*Euphagus carolinus*) (-23%), and Tennessee Warbler (*Oreothlypis peregrina*) (+4%).

Researchers believe that these bird population declines are the result of inadequate amounts of ESH in the Northeast U.S. (Dettmers, 2003). As of 2007, ESH composed 12% of the Northeast U.S. forest landscape, but if Maine is removed from the analysis (given that Maine

does not support many of the species of regional concern with more southerly distributions), the average ESH coverage for the region is 4.5% (Miles, 2013). This estimate likely overinflates the suitable habitat for ESH-reliant bird species in the region by a factor of two because 1) it includes saplings as large as five inches in diameter, which exceeds the stage at which most ESH-reliant bird species are present and 2) many species exhibit a modal relationship with stage age (i.e., they are essentially absent from very young and older areas of ESH) (Schlossberg & King, 2009). Thus, the estimate of ESH suitable for ESH-reliant songbirds in the Northeast (outside of Maine) would be 2.2% of the forested landscape. This is up to seven times less than believed to be necessary for maintaining populations of these birds in the region (Dettmers, 2003).

Human Dimensions of Forest Management for ESH

Research concerning people's beliefs, attitudes, and behavior relative to ESH and its management has been limited. Gobster (2001) suggests that people's willingness to manage for ESH can be predicted from existing research on people's interest in trees and non-timber forest products, visual and aesthetic perceptions, attitudes toward clearcutting, and recreational use. Wildlife-related recreation and protection of nature/biological diversity are important reasons landowners cite for owning their woodlands (Connelly, Brown, & Smallidge, 2007), yet many do not conduct forest management to maintain wildlife habitat and related benefits. In Connecticut, for example, the forest management activity landowners most perceived as important was "maintaining wildlife habitat" (82% indicating at least some perceived importance); yet, only 39% indicated some previous management of their forest for wildlife habitat (Sinclair & Knuth, 2000).

Of particular relevance to ESH management is private forest landowners' (PFL)[1] attitudes towards clearcutting – an even-aged cutting approach that tends to result in ESH until the trees grow back in beyond the seedling-sapling stage. Bliss (2000, p.5) describes the controversial nature of clearcutting: "more than any other forestry practice, clearcutting has been a lightning rod for public criticism." Bliss explains that opposition to clearcutting is due to the aesthetics and negative associations of clearcutting and deforestation, plantation forestry, environmental degradation, or excess and exploitation. Additionally, clearcutting was found to be more acceptable on private land, in smaller patches, and, in some cases, among people with ecological knowledge about the results of forest practices. Roper Public Affairs (2008) found through focus group research that PFLs' support for clearcutting is mixed, and PFLs instead tend to practice uneven-aged timber management (e.g., selective cutting or thinning) more often than clearcutting. Some landowners considered clearcutting harmful, whereas others thought it was acceptable if trees are replanted. Yet, Roper Public Affairs did not explore whether clearcutting would be more acceptable if it were done for wildlife habitat. Attitudes toward timber harvest depends on the motivations behind the harvest, and the American public is not generally opposed to harvesting, particularly for economic, utilitarian, and forest management purposes (Schaaf, Ross-Davis, & Broussard, 2006).

Enck and Brown (2006) found that residents of the Northeast U.S. generally held positive attitudes toward both early successional (defined as "0-20 years" in the survey) and late successional (defined as "100+ years") forest stages. Yet, 37% of residents were more positive toward late successional than early successional stages, and only 12% were more positive toward early successional than late successional stages. Enck and Odato (2008) also report that residents

[1] When I refer to private forest landowners (PFL's), I mean family and individual forest landowners, not industrial private landowners.

were largely unaware that ESH is declining. Focus groups with landowners in the Northeast U.S. interested in managing their land suggested that messaging about a diversity of wildlife requiring a diversity of habitats would be most effective for encouraging management activities for ESH (Case, Seng, & Christoffel, 2009).

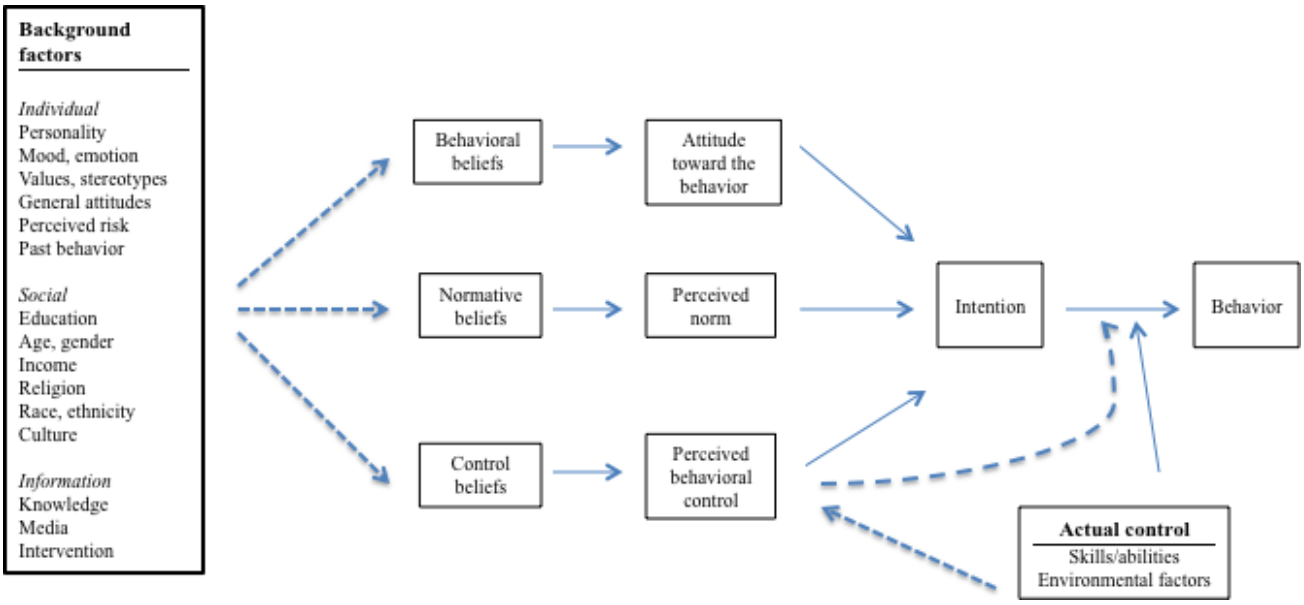
Despite these few human dimensions of ESH studies that explored attitudes and knowledge towards successional stages of forests and messaging for ESH, understanding why landowners engage in ESH management is lacking. The field is limited in its understanding of what leads to PFLs' behavior (or lack thereof) to conduct even-aged timber management for ESH. In response, I introduce and test a model to enhance understanding of this aspect of the human dimensions of ESH.

A Model for Predicting Behavior

The Reasoned Action Approach (RAA; Fishbein & Ajzen, 2010) is a social-psychological theory used to understand factors that influence behavior (Figure 2.1). Previous iterations of the RAA include the Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980) and the Theory of Planned Behavior (TPB; Ajzen, 1991). The results of studies using this theory can inform the design of communications aimed at influencing behavior. In the RAA, one's behavioral intention (or "readiness to perform the behavior") is the "best single indicator of behavior" (Fishbein & Ajzen, 2010, p. 21). Behavioral intention, along with actual skills and abilities and environmental factors (actual external resources and constraints on behavioral performance), influence the ultimate behavior. In the RAA, behavioral intention is influenced by direct and indirect determinants. Direct determinants of behavioral intention include attitudes (tendency to respond with a degree of favorableness to a psychological object) toward the behavior, norms (acceptable behavior in a group or society) to conduct the behavior, and

perceived behavioral control (PBC; perception of one's control over a behavior) (Fishbein & Ajzen; Figure 2.1). At the next level of the model, beliefs influence behavioral intention indirectly through the direct determinants of behavioral intention (Figure 2.1). According to this model, behavioral beliefs (perceptions of likely consequences) influence attitudes, normative beliefs (perceptions of demands placed on people by others) influence normative pressure, and control beliefs (perceptions of resources and barriers) influence PBC (Fishbein & Ajzen). Fishbein and Ajzen assert that determining the relative influence of attitudes, norms, or perceived behavioral control on the behavioral intention is most useful for designing behavior change campaigns that will be based on the associated beliefs.

Figure 2.1. The Reasoned Action Approach (RAA) model from Fishbein and Ajzen (2010).



Finally, "background factors" are included in the RAA as the "origins of these beliefs", including socio-demographic attributes, culture, exposure to information, emotion, personality, perception of risk, values, and past behavior. In the RAA, Fishbein and Ajzen represent the relationship between background factors and beliefs with a dotted line to designate that "although a given background factor may in fact influence behavioral, normative, or control beliefs, there is no

necessary connection between background factors and beliefs…it is difficult to know which ones should be considered without a theory to guide selection in the behavioral domain of interest" (p. 25). Elsewhere, though, they state that the effects of background factors are "almost always indirect (i.e., mediated) rather than direct" (p. 409). Thus, identifying which background factors are at play in a given domain of behavior, and how these factors operate, will add critical depth to researchers' and practitioners' understanding of the behavior.

Application of Fishbein and Ajzen Models to Landowners' Behaviors

The RAA and its previous iterations have well-established utility for understanding behaviors, as demonstrated by meta-analyses of various studies and contexts (Armitage & Conner, 2001; Sheppard, Hartwick, & Warshaw, 1988). Additionally, these models have been used to understand landowner behaviors, such as participation in government-sponsored riparian improvement programs (Corbett, 2002), allowing natural reforestation (instead of seeding/planting) (Karppinen, 2005), participation in carbon sequestration and trading (Thompson, 2010), and timber harvesting (Young & Reichenbach, 1987; see Table 1).

Here, I review the results of the predictive models for ten landowner studies. Four of the studies did not measure a behavioral intention as their dependent variable, instead focusing on current or past behavior (Beedell & Rehman, 2000; Bieling, 2004), attitudes toward the behavioral intention (specifically approval of fuel management approaches; Vogt et al., 2005), and use of information in decision-making (Artikov et al., 2006). Five of these studies were conducted on non-industrial private forest landowners (NIPFs; Bieling, 2004; Karppinen, 2005; Pouta & Rekola, 2001; Thompson, 2010; Young & Reichenbach, 1987). Additionally, two studies focused on farmers (Artikov et al., 2006; Beedell & Rehman, 2000) and one each on rural landowners abutting waterways (Corbett, 2002), industrial private forest landowners (Thompson,

2010), and landowners in the wildland-urban interface (Vogt et al., 2005). Six of the studies that measured attitudes, norms, and PBC as predictors of behavioral intentions used regression models and/or Pearson correlation coefficients, allowing for comparison of the significance and intensity of the relationship between variables.

Attitudes: most consistent predictor of the direct determinants. Attitude was a significant positive predictor of behavioral intention in all but one of the studies (Corbett, 2002). Norms were slightly less consistent as a significant positive predictor of behavioral intention: they were significant in three of the studies (Karppinen, 2005; Pouta & Rekola, 2001; Thompson, 2010 [non-industrial private forest landowner component]), but significant only in certain behaviors or certain types of norms in two of the studies (agronomic decisions in Artikov et al., 2006; water-related norm as opposed to a general norm in Corbett, 2002) and not at all in the industrial landowner study (Thompson, 2010). PBC had similar mixed results with positive significance in the same three studies where norms were significant, again just in certain situations in the Artikov et al. and Corbett studies (agronomic decisions and the self-efficacy but not internal or external PBC measures), and not at all in the industrial landowner study (Thompson).

Furthermore, attitudes tended to be the strongest predictor of behavioral intention. Six studies included measures allowing for comparison of strength of predictors. Attitudes were the strongest predictor of behavioral intentions in four of these studies (Artikov et al., 2006; Karppinen, 2005; Thompson, 2010 [both studies in dissertation]). In the other two studies, PBC was the strongest in one (Pouta & Rekola, 2001), and norms related to water was the strongest in the other (Corbett, 2002).

Table 2.1. Studies of landowner behavior applying the Theory of Planned Behavior or Theory of Reasoned Action.

Authors (Year)	**Type of landowner**	**Behavioral Intentions**	**Theory Variables**	**Additional Variables**
Artikov et al (2006)	Farmers in Nebraska (n=698)	Use of weather and climatic information and forecasts in: 1. Agronomic decisions-short term, 2. Agronomic decisions long-term, 3. Crop insurance decisions, 4. Marketing decisions (NOT intentions)	Attitudes, Norms, Perceived Behavioral Control (PBC) (including Self-efficacy & Controllability & Preference for control)	Financial capability, Geographic location
Beedell & Rehman (2000)	Farmers in UK (n=100: 64 farmers & 36 in conservation group)	Farm conservation features and management: 1. Hedge management, 2. Field margin management, 3. Tree planting and management, 4. Hedge removal, 5. Hedge planting, 6. Pesticide use (NOT intentions)	Attitudes, Belief strength, Outcome evaluation Subjective norm, Normative belief, Motivation to comply, PBC, Control belief, Power of control belief	none
Bieling (2004)	NIPF in Germany (n=~900)	Adoption of close-to-nature forestry practices (NOT intentions)	Attitudes Referent groups	Cultural biases, Process of modernization
Corbett (2002)	Rural landowners abutting waterways in Utah (n=209)	Future participation in a government-sponsored riparian improvement program	Attitude toward behavior, Social norm, Social norm-water, Self-efficacy, PBC-internal, PBC-external; Environmental attitudes, Moral responsibility	External constraints and social barriers, Financial motivations, Past behaviors, Exposure to government information
Karpinnen (2005)	NIPF in Finland (n=154)	Choice of natural reforestation (instead of seeding/planting)	Attitude, Subjective norm, PBC	Past behavior, Use of own labor force, Former delays, Demographics, Ownership objectives (non-timber; economic)
Pouta & Rekola (2001)	NIPF in Finland (n=70)	Willingness to pay for abatement of forest regeneration	Attitude, Norm, PBC, Beliefs (outcome and evaluation) on attitude	Role of information

Thompson dissertation chapter a (2010)	NIPF in US (n=435)	Future participation in carbon sequestration and trading	Attitude, Subjective norm, PBC	Innovativeness, Perceived risk, Environmental orientation, Knowledge
Thompson dissertation chapter b (2010)	Industrial private forest in US (n=44)	Future participation in carbon sequestration and trading	Attitude, Subjective norm, PBC	Legislation presence, Legitimacy of carbon credits, Short-termism, Legislative effectiveness, Acres, Organization size
Vogt et al. (2005)	Landowners in wildland-urban interface in CA (n=544), FL (n=357), MI (n=1244)	Approval of fuel management approaches – prescribed burning, mechanical fuel reduction, and defensible space ordinance (NOT intentions)	Attitude, Beliefs	Past experience, Personal importance of fuel management approaches, and Agency trust
Young & Reichenbach (1987)	NIPF in Illinois (n=621)	Future timber harvest in next 10 years	Attitude, Subjective norm	none

Neglecting beliefs. Most of these landowner studies only include the direct determinants of behavioral intentions from the TPB—attitudes, norms, and PBC. Only a few studies considered the beliefs that influence the direct determinants (i.e., (Beedell & Rehman, 2000; Pouta & Rekola, 2001; Vogt et al., 2005), and only Beedell and Rehman considered all of the sets of beliefs; however they did not measure the influence on direct determinants. In the studies that did measure beliefs, Pouta and Rekola (2001) found beliefs have a positive significant influence on attitudes but Vogt et al. (2005) found the influence on attitudes depended on which of several beliefs they measured.

Research summary and gaps. There is a strong legacy of the use of the RAA and its previous iterations for understanding the behavioral intentions of landowners. The models (along with the adaptations described) tend to perform reasonably well in predicting these landowner behavioral intentions, with 23-53% of the variance explained (in those studies with such a measure). For landowner behavior, attitudes are the strongest predictor of behavioral intention. However, results are mixed for both norms and PBC. While some landowner behavioral intentions were influenced by norms and PBC, there were no dominant patterns, and the influence of these two direct determinants remains unclear. There are indirect influences of beliefs and background factors as well that, if more was known about them, might improve understanding of landowner behavior. Few studies measure beliefs as indirect determinants of behavior, yet beliefs play an important role in decision-making.

The RAA provides a well-tested approach to understand landowner behavioral intentions, but the background factors have not been theorized—and hence, not well specified—in this model. Some potential "background factors" exist from the additional variables the landowner researchers added into the TRA and TPB. The focus of these factors has been landowner

characteristics and other contextual variables, but not yet characteristics of the land itself. Past behavior is a landowner characteristic that has commonly been included (Corbett, 2002; Karppinen, 2005; Vogt et al., 2005). Corbett (2002) included three past behavior measures as predictors of behavioral intention, along with the direct determinants, finding the past behavior measures to be some of the strongest predictors. More in line with the RAA, Karpinnen (2005) included past behavior with a suite of "external variables" influencing the direct determinants. He found that past behavior predicted each of the three direct determinants more strongly than any of the other external variables. It also directly influenced behavioral intention. In contrast, Vogt et al (2005) found that past behaviors were not significant predictors, once they controlled for beliefs and personal importance.

The debate about the role of past behavior in predicting behavioral intention has raged outside of the landowner literature. While Fishbein and Ajzen (2010) include past behavior as a "background factor" in their RAA model, they acknowledge that it is well known as a "very good predictor" (p. 285) of behavioral intention. Given that the relationship between past behavior and future behavior is often not fully mediated by the predictors in the RAA (Albarracín, Johnson, Fishbein, & Muellerleile, 2001; Ouellette & Wood, 1998), researchers have suggested that it be added to the theory. Fishbein and Ajzen (2010) counter the suggestion with the argument that past behavior "does not meet the criterion of causality" (p. 286). They argue that an explanation that one behaves in a certain way now because of past behavior does not resolve why they behaved that way the first time. Others provide a causal explanation of behavior becoming habit or coming under direct control of stimulus cues, and bypassing intentions and PBC (e.g., Ouellette & Wood, 1998; Verplanken, Aarts, van Knippenburg, & Moonen, 1998). This habituation explanation is dismissed by Ajzen (2002) in a meta-analysis

showing that the residual impact of past behavior is attenuated when measures of intention and behavior are compatible (i.e., similar item responses options are used) and when intentions are strong and well-formed. Further, it has been shown that past behavior can predict behavioral intentions, even after controlling for its effect on attitudes, norms, and PBC (Albarracín et al., 2001; Rise, Sheeran, & Hukkelberg, 2010; Sandberg & Conner, 2008; Terry, Hogg, & White, 1999). Meta-analyses exploring this relationship have found that adding past behavior to the prediction of behavioral intention by the direct determinants increases the explained variance by approximately 10% (Rise et al., 2010; Sandberg & Conner, 2008). This finding runs counter to the RAA that proposes that attitudes, perceived norms, and PBC should account for the meaningful variance in behavioral intention.

Additionally, other frameworks have employed other landowner and land characteristics to understand landowner behavior. Socio-demographic variables include those specific to landowners (e.g., length of land tenure and amount of land owned; e.g., Poudyal & Hodges, 2009; Langpap, 2004). Wildlife-related organizational membership has been shown to correlate with landowner behavior related to forest management (e.g., Nagubadi, McNamara, Hoover, & Mills, 1996) and wildlife habitat management ((Langpap, 2004). Parcel size is the most commonly employed land characteristic in landowner behavior models. Similarly, the "site silvicultural history" has been used as a predictor of actual success of afforestation, including percent of property forested and previous land use (Ross-Davis, Broussard, Jacobs, & Davis, 2005).

Given my review of previous research related to landowners' management behavior, I suggest including "background factors" (i.e., past behavior, residence, organizational membership, amount of land owned, and composition of the land types) in the RAA to better

understand and predict landowner behavior. I expect that an application of the full form of the RAA will find attitudes as the most consistently significant and strongest predictor. I also expect norms and PBC to likely be (although not surely) significant as well, with enhanced additional understanding through beliefs and theorized background factors. It is likely that past behavior will be the strongest background factor and possibly influence behavioral intention directly as well as indirectly.

Research Questions

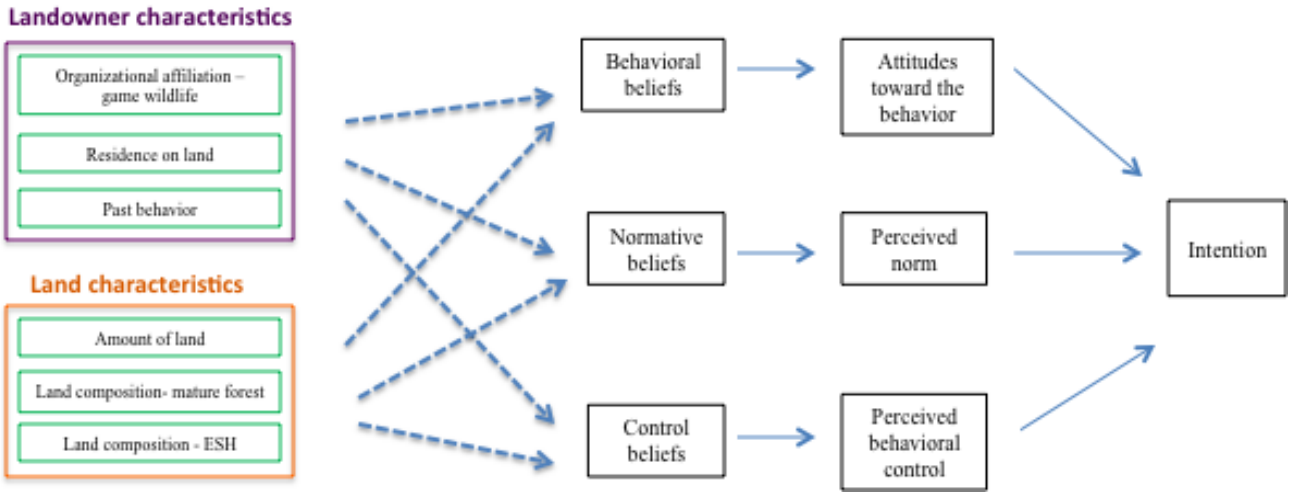
The over-arching goal of this research is to gain a better understanding of what influences private landowners' intentions to conduct even-aged forest management, specifically small clearcuts of more than ½ acre (hereafter, referred to as "patch-cuts"), which can result in ESH. I am interested in how cognitions previously found to be predictive of landowner management behavioral intentions (attitude, norm, PBC, and beliefs) explain differences in landowners' intentions to create patch-cuts. I also explore the role of the RAA model's "background factors" on beliefs, by developing and empirically testing an adaptation of the RAA model for landowners. Specifically I compare the role of "landowner characteristics" (membership in a game wildlife organization, residence on land, past behavior) and "land characteristics" (amount of land, amount of mature forest, and amount of ESH) in predicting beliefs, direct determinants, and behavioral intentions relating to ESH management on private lands (Figure 2.2).

My research questions were:

1) To what extent do direct determinants (i.e., attitudes toward the behavior, perceived norm, and perceived behavioral control) explain behavioral intention to cut patches of trees? Which social-psychological construct predicts behavioral intention most strongly?

2) What role do beliefs have in predicting behavioral intentions—1) to what extent do beliefs predict the direct determinants of behavior (i.e., do behavioral beliefs predict attitudes toward the behavior?; do normative beliefs predict perceived norm?; do control beliefs predict perceived behavior control?) and 2) are the influences of beliefs on behavioral intention mediated through the direct determinants of action?
3) Do land or landowner characteristics as "background factors" provide an improvement to the RAA for understanding behavioral intentions to patch-cut? Also, do each of the characteristics have a relationship with the beliefs, direct determinants, and behavioral intention?

Figure 2.2. Model for determining landowners' behavioral intentions (based on Fishbein & Ajzen's RAA).



Note: In the depiction of this model (Figure 2.2), I retain the dotted lines for background factors' influence on behavioral, normative, and control beliefs (as in the RAA) because the specific pathways are not predicted by past research or Fishbein and Ajzen's (2010) theory.

Methods

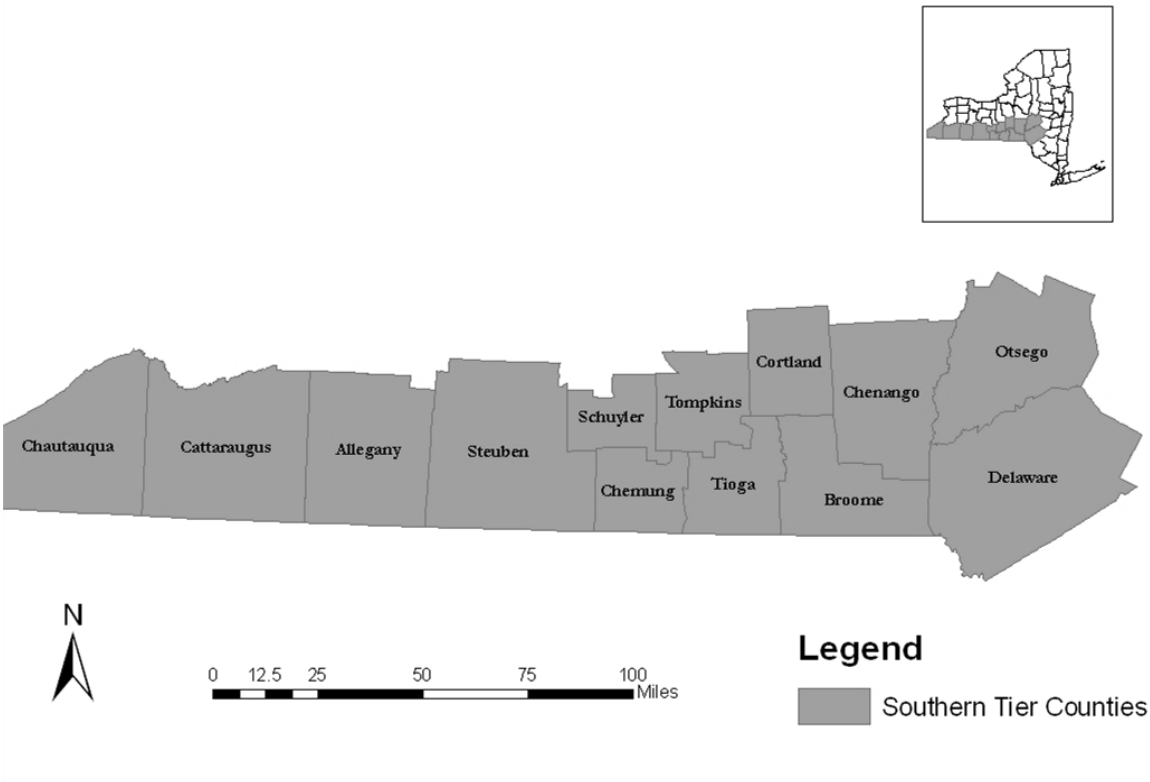
I employed sequential mixed methods, incorporating both quantitative and qualitative research in this study of private landowners in New York State. Mixed methods approaches

have been recommended for effective research on PFLs (Bliss & Martin, 1989; Hodgdon, Cusack, & Tyrrell, 2007). Further, Fishbein and Ajzen (2010) also suggest that research with the RAA include multiple methods to ensure the measures for a population-wide survey are well designed. This study first employed qualitative research methods including interviews of 29 subject matter experts – professionals who specialize in research, outreach, or management for ESH—followed by 32 interviews with landowners experienced in ESH management (Dayer, Allred, Stedman, Decker, & Enck, 2011; see Appendix B). These qualitative findings, in addition to providing unique insights in their own right, informed the design of a quantitative landowner survey. I present only the quantitative data in this paper. All of the phases of research were reviewed, under protocol 1006001472, by the Cornell University Office of Research Integrity and Assurance and qualified for Exemption from the Institution Review Board.

Study Area

The study focused on New York State, where, according to Forest Inventory and Analysis data from 2007, 7.8% of the forestland acreage is in seedling-sapling stage (Miles, 2013). Of the 1.95 million acres of seedling-sapling forestland in New York, 89% is in private ownership (Miles, 2013), compared to 77% of all New York State forestlands of all ages (Butler, 2008). The survey research was conducted in the Southern Tier counties of Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Cortland, Tioga, Broome, Chenango, Otsego, and Delaware (Figure 2.3). This area was selected by the project team (which included wildlife biologists, foresters, and social scientists) given the greater amount of mature forest cover compared to other areas in the state and the potential benefit, according to the state agency, for creation of ESH through timber management activities here (Dayer et al., 2011).

Figure 2.3. The Southern Tier counties of New York State where survey research was conducted.



Survey of Southern Tier Landowners

Sampling. I conducted a mail survey of a stratified random sample of landowners holding at least 10 acres of land in at least one contiguous parcel in one of the thirteen Southern Tier counties. The study team determined that 10 acres should be the minimum, given New York State DEC policies for support of forest management which currently requires such acreage.

Given that past research has found that parcel size influences forest owner attitudes, behaviors, and intentions (Butler, 2008), the study team sought to ensure that the sampling approach would provide for an adequate number of responses from landowners with forest lands of various acreage. According to Butler (2008), New York State has five times as many landowners with 10-49 acres as with 50-99 acres and seven times as many with 10-49 acres as with 100-499 acres. Thus, in order to ensure an adequate number of those with large landholdings, a distinct sampling frame was created for those with 50 acres or more and for those

with 50 acres or less. From each sampling frame, surveys were mailed to 1250 potential respondents (2500 total landowners).

The sample was drawn from tax code records obtained from the New York Department of Taxation and Finance Office of Real Property Tax Services. The selection of participants was limited to parcels with Office of Real Property tax codes that might include PFLs. From the properties sampled those that were business names were removed given my focus on individual or family forest owners. For further description of the sampling approach, see Dayer, Allred, Stedman, Decker, Enck, & Kurth (2011).

Survey design and measurement. The mail survey instrument was designed as an 8.5" x 11" booklet. The survey asked landowners to respond by considering all of their parcels of land in the Southern Tier. Kauneckis & York (2009) advocate for asking landowners about their land portfolio (or all of the land owned and managed by a landowner) given that 1) incentives—and management more generally—often transcend a single parcel and 2) landowners have been found to have difficulty distinguishing individual parcels and most consider parcels as combined except for tax purposes.

The dependent variable in the proposed model (Figure 2.2) was landowner behavioral intentions to create a patch-cut: "cutting a patch of tress [at least a ½ acre] where all or most of the trees were removed [to open the canopy] and then plants and trees were allowed to grow back." The word "clearcut" was not employed given concerns that this term can evoke a negative response. The response options were "not at all likely", "slightly likely," "moderately likely," and "very likely." Behavioral intention was collapsed into a binary variable from a categorical variable with "0" for no intention to cut in the next five years and "1" for at least "slightly likely" to cut in the next five years. Attitude toward this behavior was assessed with two Likert-type

items (e.g., “very bad” to “very good”) for their land and for wildlife. One item assessed perceived norm (descriptive, rather than injunctive) by asking respondents “how common it is that other landowners in your areas do this activity.” Respondents answered on a four-point scale from “not at all common” to “very common”. “Other landowners in your area” were used as the referent group given that it would be most appropriate for this group to be performing the behavior. Respondents were also given an option to select “don’t know.” PBC was assessed by one four-point scale item “to what extent do you feel you are able to get the following activity done on your land [if you decide to do so]?” to which they could respond from “not at all able” to “very able”.

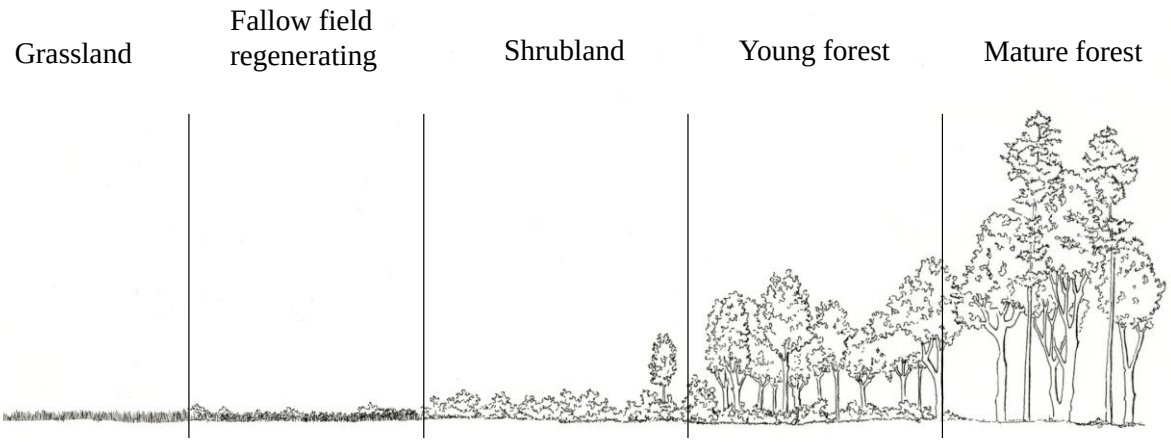
Behavioral belief was a mean scale that included six items about management of land and wildlife, which were measured on a 5-point scale. Normative belief was measured as an injunctive norm on a 4-point scale with same referent group as perceived norm—“nearby landowners”. Control belief was a mean scale composed of eleven items on a 5-point scale representing potential barriers to performing cutting, prefaced by the question of “the extent to which you cut on your land is limited by the following factors.” The resulting mean scale was reverse-coded for analyses to reflect a control belief (i.e., not influenced by barriers). See Table 2.2 for items.

For membership in a game wildlife organization, a mean scale was created from “yes” or “no” responses to list of organizations following the question “which wildlife or land organizations are you a member of?” Game wildlife organization options included National Wild Turkey Federation, Pheasants Forever, Quality Deer Management Association, and Ruffed Grouse Society. Residence on land was measured as “yes” (listed distance from any of the parcels was less than one mile) or “no” (listed distance from all parcels was greater than one

mile). Past behavior was also measured with a "yes" or "no" response option, using the same behavior description as the behavioral intention and considering the last ten years. Amount of land was measured as total acreage on all parcels in the Southern Tier.

For the items about land types, an image was provided to respondents (Figure 2.4). They were asked, "About how many acres of each of the following types of land do you own in the Southern Tier?" Additionally, short definitions were given for the ESH land types: shrubland included "more than 25% brush" and young forest included "most trees with trunks less than 4" in diameter." Mature forest did not include an additional written explanation. Based on the numbers recorded, I calculated a percentage of total land in mature forest, as well as young forest and shrubland categories. The latter two types I then combined for a percentage of land in ESH measure.

Figure 2.4. Illustration of land types that was presented to landowners in the survey.



Data collection. Data were collected from November 2010 to January 2011 using mail-back questionnaires following a modified Tailored Design Method approach (Dillman, Smyth, & Christian, 2009). The approach consisted of four mailings: cover letter and questionnaire, reminder postcard, cover letter and replacement questionnaire to non-respondents, and reminder postcard to non-respondents. After the initial mailing, follow-up mailings were conducted at

regular intervals at a maximum of two weeks apart.

In total, 1036 individuals responded to the survey (521 from the 10-49 acre strata; 514 from the 50 or more acre strata). After accounting for undeliverable mailings, the overall response rate was 43%. For the purpose of the model analysis, both landowner strata were combined to ensure adequate sample size to test a model with numerous predictors. It was not possible to weight the sample as many respondents owned more than one parcel, and a population estimate was unavailable for total acreage size.

A telephone survey was administered to a random sample of 50 non-respondents from each stratum in an effort to identify any sources of nonresponse bias. The Survey Research Institute at Cornell University (SRI) conducted the telephone surveys. The telephone survey included a subset of items (land characteristics, preferences for land characteristics, attitudes, ownership motivations, beliefs, cutting behavior, gender, age, and education) from the mail back survey to allow for comparison between respondents and non-respondents to the mail survey. T-test and chi-square tests revealed that the respondents and non-respondents differed significantly on two land characteristics, several motivations, behavioral intentions, and education level (see Appendix A). However, the effect sizes of these differences were minimal (Vaske, 2008), so the respondent sample was not weighted.

Analysis

I conducted analyses with SPSS 21.0 and SPSS AMOS 21.0. To assess my research questions associated with the RAA with a dichotomous dependent variable (behavioral intention), I employed Bayesian structural equation modeling using Markov Chain Monte Carol simulations. Structural equation models (SEM) allow for evaluating a series of simultaneous hypotheses about the impacts of variables on each other, while also taking measurement error

into consideration (Lee, 2007). The Bayesian SEM (BSEM) approach is appropriate for models with ordered categorical variables, dichotomous variables, and missing data, which were all characteristics of this study (Lee, 2007; Song & Lee, 2012).

In the model for research question one, behavioral intention was the dependent variable in the BSEM with attitudes toward the behavior, perceived norm, and PBCas first level predictors. In research question two, the model in research question one was compared to a model that added behavioral beliefs predicting attitudes; normative beliefs predicting perceived norm; and control beliefs predicting PBC. To address the second part of the research question, I additionally explored the relationship between beliefs and behavioral intention, controlling for the direct determinants. For research question three, a model with land characteristics added to the components of the model for research objective two was compared with a model with landowner characteristics added instead. In each model, the relationship between each characteristic and each belief was considered. Additionally, the relationship between past behavior and the direct determinants and the behavioral belief was assessed for the land characteristics model and the landowner characteristics model.

For BSEM analyses in AMOS, models are considered to have converged when the convergence statistic falls below 1.002 (Arbuckle, 2009). For model comparisons I used the goodness of fit measures of posterior predictive *p*-value (PPP) and the Deviance Information Criterion (DIC). PPP assesses the model's specification quality in terms of predictive accuracy (Kaplan & Depaoli, 2012). A PPP around .50 indicates a plausible model while one closer to 0 or 1 indicates that the model is not plausible (Song & Lee, 2012). When comparing models, the model with the smallest DIC is preferred (Kaplan & Depaoli, 2012). Posterior means, which are the average of the posterior distribution, are reported as the parameter estimates (Arbuckle,

2009). Statistical significance of individual posterior means was examined via credible intervals (i.e., the Bayesian equivalent of confidence intervals). Posterior means were determined to be significant when the 95% credible intervals (also known as posterior probability interval) excluded zero.

Results

Characterizing respondents

Landowners were primarily male (82%) and on average sixty-one years old (*SD* = 12). Thirty-eight percent had a college undergraduate or higher degree. Fifty-nine percent of the landowners lived on at least one of their parcels in the Southern Tier. Landowners owned their land for twenty-three years on average (*SD* = 16), and had 124 acres on average across all of their parcels in the Southern Tier (*SD* = 172). Ten percent of landowners belonged to at least one game wildlife organization.

Forty-seven percent of respondents had no intention to cut patches of trees on their land in the next five years, while fifty-three percent had at least some intention of doing so. Thirty-two percent had cut patches on their land in the last ten years. Fifty-two percent of landowners held a positive attitude, believing it was good to cut patches of trees for land and wildlife, while twenty-five percent held a negative attitude. Sixty-seven percent of landowners believed it was at least slightly common for landowners to cut patches of trees (norm), and eighty-six percent of landowners felt they were at least slightly able to cut patches of trees themselves or get someone to do so if they desired (PBC).

Scale construction

The attitude scale included two items. The Cronbach's alpha for reliability of the mean summative scale was 0.86. The behavioral belief scale included six items about management of

land and wildlife with a high reliability (alpha = .83; Table 2.2). Normative belief was measured with a single item. Control belief was measured with eleven barriers items (Table 2.2) prefaced by a question of the "extent to which you cut on your land is limited by the following factors." The resulting mean scale had a high reliability as well (alpha = .86; Table 2.2). The scale was reverse-coded for analysis.

Table 2.2. Behavioral, normative, and control beliefs scales and means of items.

Belief Scale and Individual items	Mean
Behavioral belief mean scale (alpha = 0.83)[1]	3.64
-Land, and the plants and trees on it, should be left to exist naturally without being managed by people (reverse-coded in scale)	2.41
-Wildlife should be left to exist naturally without being managed by people (reverse-coded in scale)	2.60
-Wildlife benefits from management by people	3.78
-Land benefits from management by people	3.93
-To benefit wildlife, land is best left untouched (reverse-coded)	2.46
-Generally, cutting trees on the land is good for wildlife	3.57
Normative belief [2]	3.11
- How bad or good do these groups of people think cutting a patch of trees (at least ½ acre) where all or most of the trees were removed would be for your land?	
Control belief mean scale (alpha = 0.86) [1]	2.68
-I don't have enough time	3.07
-I don't have enough money	2.68
-I don't have a market for products	2.78
-I don't have enough knowledge about how and where to cut	2.78
-I don't have enough knowledge about why to cut	2.68
-I don't have someone skilled enough to do the work	2.34
-I don't have adequate equipment or tools to do the work	2.53
-I don't have enough support from foresters	2.70
-I don't have enough support from wildlife biologists	2.91
-I don't have enough supportive state and local regulations	2.83
-I don't have enough acreage	2.26

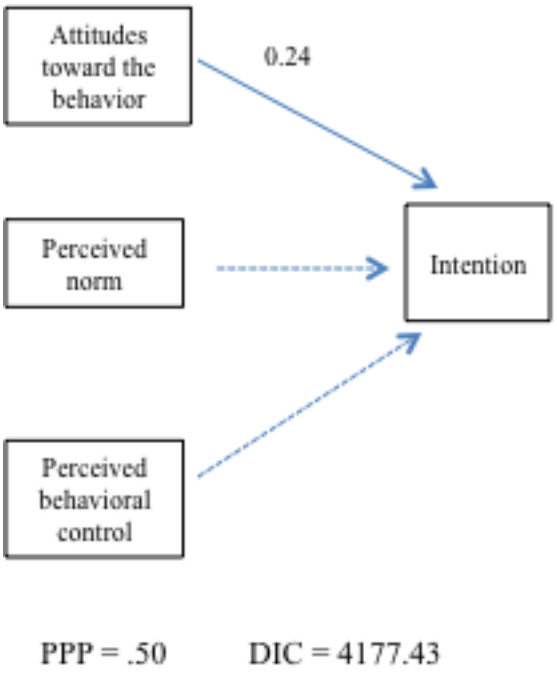
[1] Items were assessed on a five-point scale: 1 = "strongly disagree"; 2= "disagree"; 3= "neither"; 4 = "agree"; 5 = "strongly agree."

[2] Items were assessed on a five-point scale: 1 = "very bad"; 2 = "bad"; 3 = "neither"; 4 = "good"; 5 = "very good." A "don't know" option was also provided.

Scales were also created for membership in a game wildlife organization, including National Wild Turkey Federation, Pheasants Forever, Quality Deer Management Association, and Ruffed Grouse Society (Cronbach's alpha for scale = 0.62).

Research question 1 – direct determinants of behavioral intention. Bayesian SEM results (Figure 2.5) indicated attitudes toward the impact of the behavior on land and wildlife positively predicted intention to cut patches of greater than ½ acre in the next five years (Beta = 0.24). However, norms related to the behavior and perceived behavioral control did not predict the behavioral intention. The PPP (.50) indicated reasonable model fit, and the DIC was 4177.43.

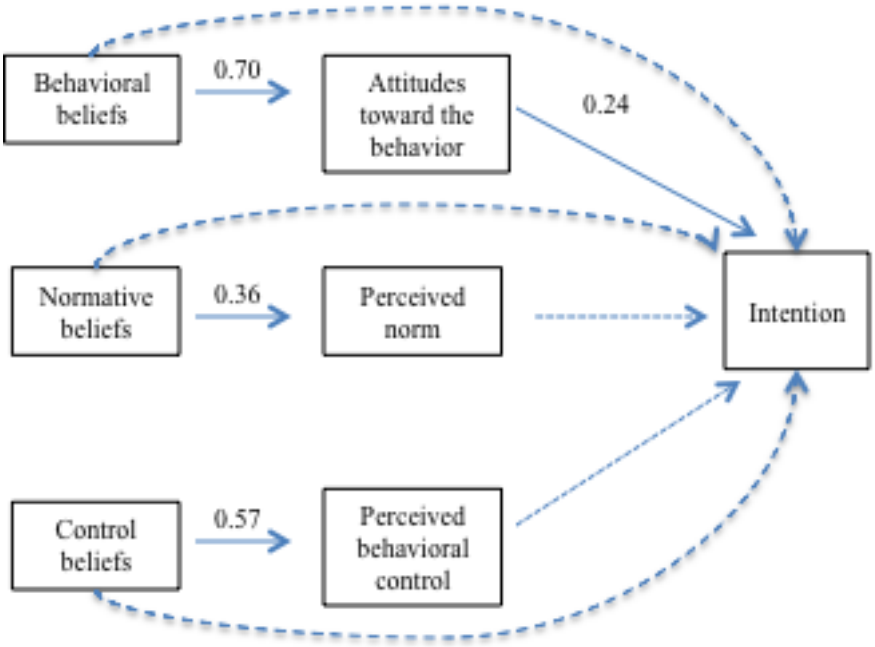
Figure 2.5. Bayesian Structural Equation Model results for direct determinants influencing patch-cut behavioral intention.



Note: Solid lines (as opposed to dashed lines) indicate 95% Bayesian credible interval for the parameter estimate.

Research question 2 – the role of beliefs on direct determinants. Bayesian SEM results (Figure 2.6) indicate that beliefs (behavioral, normative, control) each positively predicted their respective direct determinants. Behavioral beliefs' relationship with attitudes was the strongest (Beta = 0.70), followed by control beliefs with perceived behavioral control (Beta = 0.57) and then normative beliefs with perceived norm (Beta = 0.36). None of the beliefs were significant direct predictors of intention beyond their relationship through the direct determinants. As indicated by goodness of fit measures (DIC = 4829.67), the fit was not as good for this model as that with just the direct determinants; although the PPP was still adequate (.52).

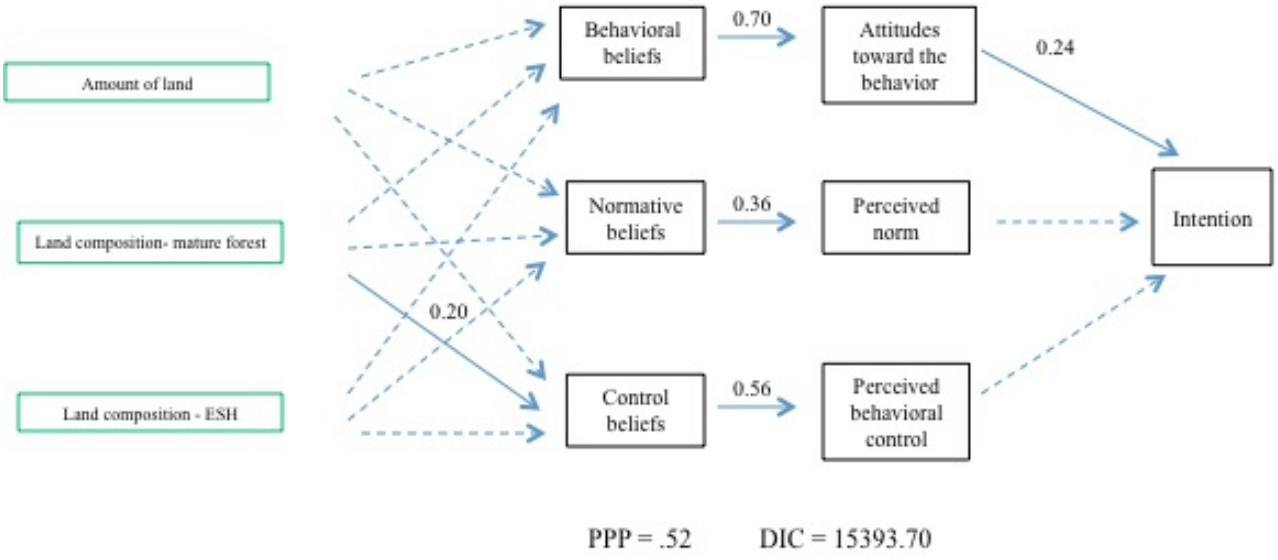
Figure 2.6. Bayesian Structural Equation Model result for direct determinants influencing patch-cut behavioral intention and beliefs influencing direct determinants.



Note: Solid lines (as opposed to dashed lines) indicate 95% Bayesian credible interval for the parameter estimate.

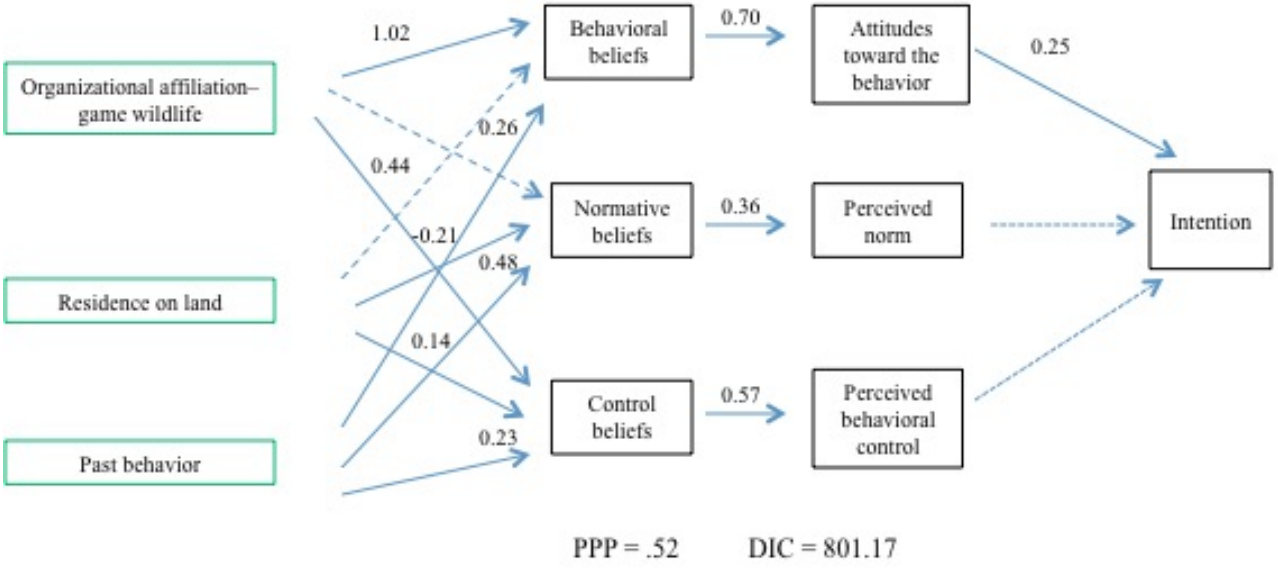
Research question 3 – landowner and land characteristics effects on the cognitive model. When comparing the land "background" characteristics (Figure 2.7) and landowner "background" characteristics (Figure 2.8) models, the landowner characteristics model performed better (DIC = 801.17) than did the land characteristics model (DIC = 15393.70). Both models had adequate measures of PPP (.52). In the land model, only percentage of mature forest significantly, positively predicted control beliefs (Beta = 0.20). Otherwise, the land characteristics had no relationship with beliefs. All of the landowner characteristics significantly predicted beliefs: positive behavioral beliefs were associated with membership in a game wildlife organization (Beta = 1.02) and past behavior of patch-cutting (Beta = 0.26), but they were not influenced by residence on the land. More positive normative beliefs were associated with not living on one's land (Beta = -0.21) and past behavior (Beta = 0.48), but they were not influenced by membership in a game wildlife organization. More positive control beliefs were associated with membership in a game wildlife organization (Beta = 0.44), residence on one' land (Beta = 0.14), and past behavior (Beta = 0.23).

Figure 2.7. Bayesian Structural Equation Model results for land characteristics RAA model with background factors predicting beliefs.



Note: solid lines (as opposed to dashed lines) indicate 95% Bayesian credible interval for the parameter estimate.

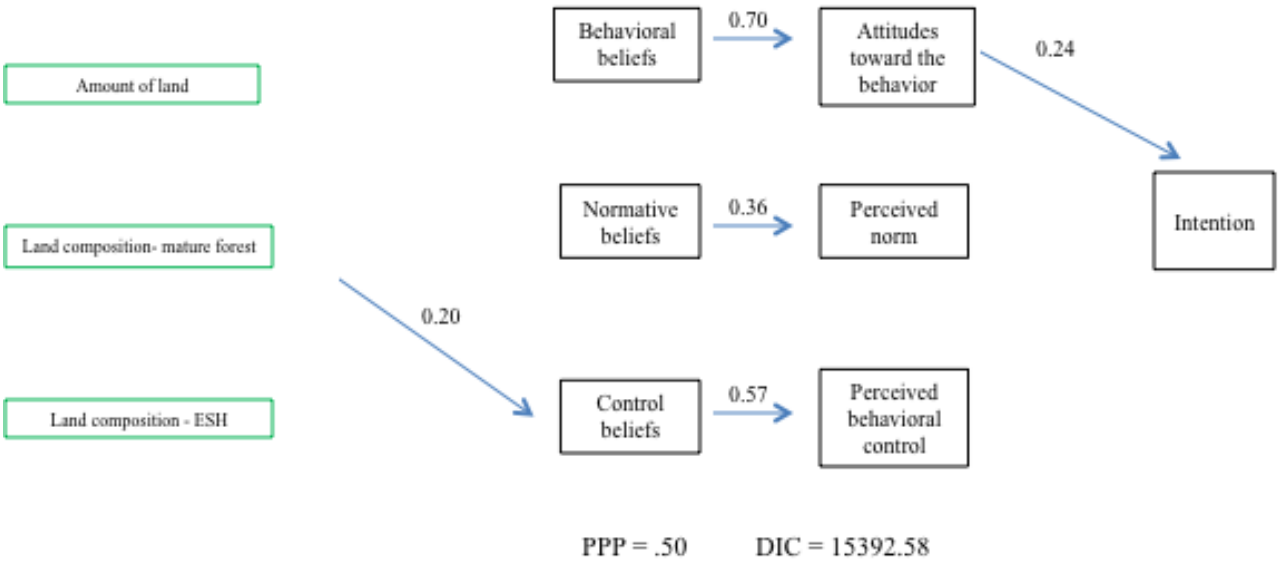
Figure 2.8. Bayesian Structural Equation Model results for landowner characteristics RAA model with background factors predicting beliefs.



Note: solid lines (as opposed to dashed lines) indicate 95% Bayesian credible interval for the parameter estimate.

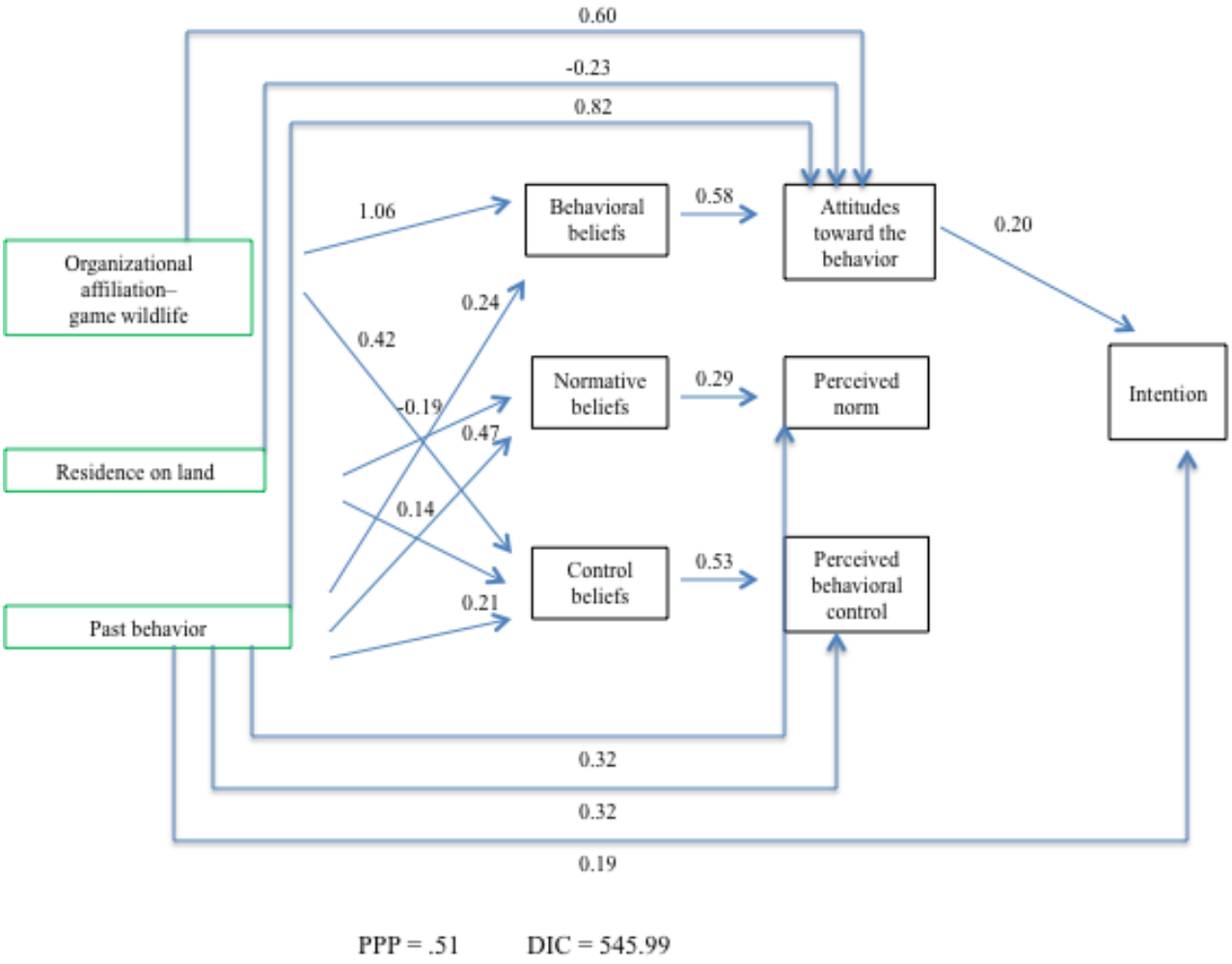
Further exploration of the relationship between the background factors (land and landowner characteristics) and direct determinants and behavioral intention revealed a model with improved fit for the landowner characteristics (Figure 2.10; DIC = 545.99; PPP = .51), but no change for land characteristics model (Figure 2.9; DIC = 15392.58; PPP = .50). None of the land characteristics had a direct effect on the direct determinants or behavioral intention beyond that explained by the beliefs. In contrast, past behavior had a direct independent positive relationship with each variable: behavioral intention (Beta = 0.19), attitudes (Beta = 0.82), perceived norm (Beta = 0.32), and PBC (Beta = 0.32). The other two landowner characteristics—membership in a game wildlife organization (Beta = 0.60) and residence on land (Beta = -0.23)—directly affected attitudes, beyond that explained by their relationship with beliefs.

Figure 2.9. Bayesian Structural Equation Model results for land characteristics RAA model with background factors predicting beliefs, direct determinants, and behavioral intention.



Note: solid lines indicate 95% Bayesian credible interval for the parameter estimate; dashed lines are omitted for ease of readability. The relationship between each background factor and each belief, each direct determinant, and the behavioral intention were tested.

Figure 2.10. Bayesian Structural Equation Model results for landowner characteristics RAA model with background factors predicting beliefs, direct determinants, and behavioral intention.



Note: solid lines indicate 95% Bayesian credible interval for the parameter estimate; dashed lines are omitted for ease of readability. The relationship between each background factor and each belief, each direct determinant, and the behavioral intention were tested.

Discussion

Consistent with the RAA, attitude toward patch-cutting most strongly influenced behavioral intention of landowners to cut patches. Contrary to the RAA, however, PBC and perceived norm did not influence behavioral intention. Although counter to the RAA, this finding is in line with other landowner literature where attitudes were the strongest significant

predictor of landowner behavioral intentions (Thompson, 2010; Artikov et al., 2006; Corbett, 2002). Also following the RAA, beliefs positively affected their corresponding direct determinants of intention, but did not directly influence behavioral intention. This finding reinforces the importance of including beliefs in these behavioral models to better understand the direct determinants and thereby fully understand why landowners do or do not conduct a behavior. However, the inclusion of beliefs is uncommon in most landowner behavioral research.

Adding background factors related to landowner characteristics greatly improved the understanding of landowners' beliefs, demonstrating the importance of including the variables and better understanding their role to enhance the theory. Most important to consider are the influences on behavioral beliefs and attitudes, given that they predicted the behavioral intention. Of particular note, those with membership in game wildlife organizations were much more likely to have positive behavioral beliefs, and were much more likely to have positive attitudes towards patch-cutting. These organizations write newsletters, sponsor workshops, support TV shows, and otherwise frequently message about their role as habitat managers, which appears to have a noticeable impact here. Of all the variables, past behavior was the only variable that influenced all three of the beliefs and also had a residual effect on all of the other variables in the model. This result is not uncommon for past behavior (Fishbein & Ajzen, 2010), which commonly predicts both cognitions and behavioral intention. Rather than a result of habituation as some believe it to be, Fishbein and Ajzen (2010) suggest that this residual effect of past behavior on intentions could be the result of missing components of the model (i.e., self-identity and anticipated effect) that explain variance that is not explained by the theory's predictors. Given this recommendation, I suggest future research explore the role of self-identity and anticipated effect to determine whether they do indeed explain some of the variance.

In contrast to the landowner characteristics, land characteristics played little to no role in understanding beliefs. This finding runs counter to other research that emphasizes the role of parcel size in landowner behavior research (Beach et al., 2005; Kauneckis & York, 2009). This finding, however, corresponds with recent research on harvest behavior in Pennsylvania that found social factors played a far greater role in predicting the behavior than do land characteristics (Metcalf, 2010). Given that I measured self-reported land characteristics, I suggest that future research still consider actual land characteristics (such as habitat cover and density of indicator species of wildlife) to explore potentially useful characteristics.

Application

In applying these findings to the development of education and outreach programs for private forest landowners, Fishbein and Ajzen (2010) suggest focusing on the strongest predictor of the behavioral intention: attitude and the associated behavioral belief. Accordingly, for organizations and agencies interested in encouraging ESH management by private landowners, education and outreach could employ messages emphasizing how patch-cuts (and management generally) can benefit the land and wildlife. To develop messaging in this vein that would be most effective, I suggest pilot testing messages and associated communications tools through landowner focus groups.

Additionally, the finding that PBC did not predict behavioral intention suggests a shift away from the current emphasis on financial incentives for landowners, such as those offered through the Farm Bill conservation programs. If landowners' intentions to conduct timber management are not affected by their perceived ability to perform the behavior, it seems unlikely that solely providing financial support for the management activities will significantly influence landowner management for ESH. Instead, this research suggests that there will not be adequate

sign-up for these incentive programs because landowners will not think it is necessary to be creating this habitat. These combined findings also suggest that agencies that administer these financial incentives for ESH (e.g., Natural Resource Conservation Service) could emphasize landowner outreach, which is currently limited in their mandate. Partner organizations' increasing their outreach to create demand for these Farm Bill programs might then be warranted.

Fishbein and Ajzen (2010) conclude that because background factors tend to have an indirect, mediated relationship with behavioral intention, the best strategy is to not focus on the background factors in application. Unlike Fishbein and Ajzen (2010), however, I found that the landowner characteristics did also influence attitude directly; therefore, I recommend that those interested in influencing behavioral intentions pay closer attention to landowner characteristics. Landowner characteristics may help those conducting outreach to locate landowners with behavioral beliefs consistent with the desired behavior to reinforce their beliefs and ensure they act on their intention. In particular, those who are members of game wildlife organizations, those who are not resident on their land, and those who conducted the behavior in the past may be targeted for outreach to support ESH management on their lands. Additionally, while we cannot be sure if the relationship between game organization membership and behavioral belief and attitude is causal, my landowner interview results (Dayer et al, 2011) and a review of game organization websites and magazines highlights that these organizations tend to put a great deal of resources into educating their members about habitat conservation activities. An efficient means of influencing attitude through behavioral belief might be through replicating the education and outreach approach already followed by game wildlife organizations. It may also be useful for ESH-related initiatives focused on non-game wildlife that rely on ESH (e.g., the

Golden-winged Warbler Working Group) to partner with game wildlife organizations, not only in learning their outreach tactics and tools and sharing similar messages, but also in potentially modifying habitat prescriptions given to game wildlife organization members that will benefit non-game species as well (e.g., retaining a few singing trees in a cut area for Golden-winged Warblers). This human dimensions research approach provides an enhanced understanding of landowners and guidance for how to improve efforts to engage landowners in cutting patches of trees to create ESH. By incorporating the results of both social science and ecological studies, it may be possible for agencies and organizations, working together, to regain measurable amounts of ESH and begin to reverse population trends for ESH-reliant wildlife.

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CHAPTER THREE: A COMPARATIVE ANALYSIS AND ASSESSMENT OF FOREST LANDOWNER TYPOLOGIES BASED ON BEHAVIORS, MOTIVATIONS, AND REASONED ACTION COGNITIONS

Abstract

Landowner typologies have become a popular way to understand similarities and differences among groups of landowners. The goal of many landowner typology studies is to provide recommendations about how to reach a diversity of landowners with targeted education, outreach, and communications. Thus far, these typologies have been primarily based on landowner behaviors or landowner ownership motivations. I suggest a new kind of typology based on cognitions from the Reasoned Action Approach (i.e., attitudes, norms, and perceived behavioral control) that are known to influence behavior and serve as a basis for understanding behavior change. To evaluate how this new typology (reasoned action) compares to the well-established typology approaches (motivations, behavior), I used three methods of assessment: reliability through split-halves, predictive validity using external variables, and application of quality typology criteria. Aside from predictive validity, these assessment techniques have rarely been applied to landowner typologies. I developed and assessed the three typologies using a New York State landowner survey dataset about early successional habitat management behavior. According to the assessment, the typology based on reasoned action cognitions was no better or worse than the more common behavior-based and motivations-based typologies. This finding should serve as a strong caution to landowner typology researchers to avoid presenting a typology as the only possible appropriate typology for a sample; other equally strong typologies may exist. Furthermore, the assessment provided a more complete understanding of the strengths and weaknesses of three different kinds of landowner typologies, suggesting that landowner typology researchers should more thoroughly compare potential typologies in a given landowner

sample in such a manner. The assessment will allow researchers to be more informed when they select a typology to use to inform education, outreach, and communications.

Introduction

Greater than one-third of the forestland in the United States is owned by private forest landowners (PFLs)[2]. Although an array of education, outreach, and communications (EOC) programs support sustainable forest management by PFLs, only a small proportion of landowners are reached by these efforts (Butler, 2008). As Butler et al. (2007, p.349) describes, EOC programs tend to "preach to the proverbial choir," acknowledging that forestry EOC primarily reaches the already engaged PFLs. Nor is there utility in preparing EOC for the "average landowner," who remains fictional and based only on statistics (Tuttle & Kelley, 1981). Instead, researchers call for more targeted EOC program design and delivery to reach a diversity of landowners.

Classification systems, or typologies[3], help practitioners understand the full range of landowners and target EOC programs accordingly. In typologies, characteristics of each segment of the population are identified, along with their preferences for different types of EOC tools and

[2] When I refer to private forest landowners, I mean family and individual forest landowners, and not industrial private landowners.

[3] While landowner classification research is commonly referred to as typology research, according to Rich's (1992) description it is in fact *taxonomy* research due to its empirical emphasis. Similarly, Bailey (1994) describes the two classification approaches as taxonomy, which is a primarily empirical classification, and typology, which is a primarily conceptual classification. A taxonomy "classifies cases according to their measured similarity on observed variables" (p.6) with a primary technique of cluster analysis. Bailey explains that many people use these two terms interchangeably, and social scientists tend to opt for "typology" while biologists tend to opt for "taxonomy." Although the majority of landowner-classification schemes are in fact taxonomies, I use the term "typology" here to maintain consistency with the landowner research lexicon.

messaging. Typologies typically define landowners based upon their adoption (or intended adoption) of a given management behavior (e.g., Tuttle & Kelley, 1981; Broderick, Snyder, & Tyson, 1996); ownership motivations (e.g., Butler et al., 2007; Majumdar, Teeter, & Butler, 2008; Ross-Davis & Broussard, 2007); or rarely attitudes paired with ownership motivations (e.g., Richter & Lewis, 2007). Thus far, more fundamental cognitions that may drive these specific motivations and behaviors have not been thoroughly considered. Yet, social psychological concepts from the Reasoned Action Approach, such as beliefs, attitudes, norms, and perceived behavioral controls, are well-established as factors that influence behavior (e.g., conducting forest management activities), and they are thought to effectively guide EOC activities designed to influence behavior (Fishbein & Ajzen, 2010).

Landowner typologies tend to be validated by researchers only through significance tests on variables external to the development of the typology, such as socio-demographic characteristics of the landowners. Without employing additional established means to compare typology quality, the literature may become oversaturated with approaches that claim utility, but that lack assessment. Methods exist outside of the landowner typology research literature to explore reliability, predictive validity, and the characteristics of a quality typology. If applied to landowner typologies, these methods could be used to increase researcher knowledge about typologies created and ensure that the typologies created will be effective when applied to EOC.

With this paper, I comparatively evaluate landowner typologies to explore how a typology based on reasoned action cognitions compares to the more commonly used behavior- and motivations-based typologies. First, I review landowner typology development approaches and suggest why a reasoned action typology may have utility. Then I introduce methods to more completely assess landowner typologies. Using a survey dataset from a study of PFLs in New

York State, I create three distinct typologies with unique sets of variables, compare their outputs, and assess their reliability, validity, and qualitative characteristics.

Literature Review

Typologies

Typologies order sets of individuals into groups, or types, based on their similarity (Bailey, 1994) by maximizing within-group homogeneity and between-group heterogeneity. Typologies allow for description, reduce complexity without losing richness and diversity, identify differences, present an exhaustive list of dimensions, and produce an inventory of types (Bailey, 1994; Rich, 1992). Typologies can be used as a device to study relationships among groups and can serve as a basis for theory development (Bailey, 1994; Rich, 1992). Landowner typology research has primarily focused on two types of typologies: those based on behavior and those based on ownership motivations (Table 3.1).

Table 3. 1. Peer-reviewed landowner typologies research with behavior or motivations as the basis of the typologies (presented in chronological order).

Year	Authors	Behavior-based	Motivations-based
1981	Tuttle & Kelley	X	
1996	Broderick, Snyder, & Tyson	X	
2002	Salmon, Brunson, & Kuhns		X
2004	Beiling	X	X
2004	Boon, Meilby, & Thorsen		X
2005	Mizaraitë & Mizaras		X
2006	Jennings & Putten		X
2007	Butler et al.	X	X
2007	Ross-Davis & Broussard		X
2007	Richter & Lewis		X
2008	Majumdar, Teeter, & Butler		X
2008	Van Herzele & Van Gossum		X
2010	Hujala, Kurttila, & Karppinen		X
2010	Novais & Canadas	X	

Behavior-based typologies. Typologies based on the wildlife-habitat and land-management behaviors of landowners have been in existence for more than 30 years (Tuttle & Kelley, 1981). This approach offers an understanding of characteristics of landowners who conduct management, compared with those who do not conduct more. The authors called for additional landowner typologies that would inform EOC program development by splitting landowners into "actual market" (i.e., already adopted activities), "potential market" (i.e., receptive to adopting), and "nonmarket" (i.e., unlikely to adopt without substantial educational efforts) types. Similarly, Broderick, Snyder, and Tyson (1996) divided landowners into four types based on their intentions to engage in forest-stewardship planning and to protect their land. They used this typology to determine different attributes of the types and target with their EOC programs to the types accordingly. More recently, Novais & Canadas (2010) created a typology using adoption of a number of types of forest-management variables, in addition to variables about how the management is conducted. Rather than the previous approach for behavior-based typologies of cross-tabulation, they used the now-more-common technique of cluster analysis.

Motivations-based typologies. More recent typology research has emphasized landowners' motivations, ownership objectives, attitudes about owning land, and perceived benefits of owning land (e.g., Majumdar, Teeter, & Butler, 2008; Ross-Davis & Broussard, 2007; Salmon, Brunson, & Kuhns, 2002). International applications of landowner-typology work have largely followed those established in the United States with an emphasis on landowners' ownership motivations (Hujala, Kurtila, & Karpinnen, 2010; Jennings & Putten, 2006; Mizaraitë & Mizaras, 2005; Boon, Meilby, & Thorsen, 2004).

Combination of motivations- and behavior-based typologies. Recently, the motivations-based approach has been integrated with the behavioral-adoption approach. Butler et al. (2007)

created a typology with a goal of developing programming to change landowner attitudes and behaviors. First, they segmented landowners into four types based on their land-ownership motivations and future plans (as described above). Then they crossed motivations with behavioral intention by placing landowners in four types based upon their current levels of involvement in management activities compared with their interest in future involvement (see Bieling, 2004, for similar work).

Beyond motivations-based typologies. Motivations-based typologies have been augmented with variables such as ownership characteristics. Ownership characteristics (i.e., acreage, tenure, residency, gender, etc.) and ownership motivations were combined in an Indiana study (Ross-Davis & Broussard, 2007). In another study of PFLs in eastern Missouri, a typology created for describing the information behavior (in terms of learning about forest ecosystems and natural resource management) based the cluster analysis on ownership motivations (specifically, reasons for owning land and land-ownership values) and attitudes and values (attitudes about collective stewardship and community values) (Richter & Lewis, 2007). Finally, a study of PFLs in Belgium (Van Herzele & Van Gossum, 2008) used ownership motivations to develop a typology for the purpose of stimulating landowners to engage in forest conversion of secondary pine plantations; the authors then selected focus group members from their three types. The focus groups aimed to learn more about the types' characteristics, how the types think about forests, and how to best communicate with the types. The researchers found heterogeneity and conflicting opinions about desired management within the types, leading them to believe that differences in attitudes and values are not captured by a motivations-based typology.

Attitudes, Norms, and Perceived Behavioral Control as Typology Variables

Given that a solely motivations-based typology does not capture fully the heterogeneity

of landowners, cognitions from social psychology theory could offer new variables to serve as a basis of landowner typologies. Concepts from the Reasoned Action Approach (Fishbein & Ajzen, 2010), which evolved from the Theory of Reasoned Action (Ajzen & Fishbein, 1980) and Theory of Planned Behavior (Ajzen, 1991), are well established as factors that influence behavior (e.g., forest management activities). Additionally, these concepts are thought to effectively guide EOC activities designed to influence behavior. In this approach, one's behavioral intention (i.e., "readiness to perform the behavior") is the focus, as the "best single indicator of behavior" (Fishbein & Ajzen, 2010, p. 21). The primary predictors of behavioral intention include attitude toward the behavior (i.e., tendency to respond with a degree of favorableness), norm related to the behavior (i.e., what is acceptable in a group or society), and perceived behavioral control (i.e., one's perceived ability to conduct the behavior if one wants to; Fishbein & Ajzen, 2010). While these concepts have proven effective to better understand a variety of landowner behaviors (see Chapter 2), they have not been used as variables to create landowner typologies.

Assessment of Typologies

Assessment of typologies after their creation is a critical step in determining how they address potential weaknesses and perform against criteria that describe a quality typology. Typologies have been subject to criticism for 1) being descriptive rather than predictive, 2) leading to reification (constructs that do not exist empirically treated as real), 3) being static rather than dynamic, 4) being unmanageable if there are too many categories, 5) poorly sorting cases and variables, and 6) depending too heavily on classes rather than continuous data (Bailey, 1994). Bailey (1994) contends that these criticisms do not always hold (e.g., classification is not always descriptive), and in some cases, more advanced techniques (e.g., cluster analysis) and

quality assessments can alleviate these criticisms. Furthermore, some of the criticisms are not unique to classification (e.g., unmanageability), or they may be overstated (e.g., static classification). A poorly constructed typology could exhibit many of the issues described above, making quality assessments crucial.

Whereas many landowner typologies are designed to guide creation of EOC programs, their quality is rarely rigorously assessed before recommendations based on the typologies are offered. Statistical validation is lacking (for an exception, see Majumdar, Teeter, & Butler, 2008). This is particularly problematic as many of these typologies are created through cluster analysis. As Aldenderfer and Blashfield (1984, p.14) explain, cluster analysis methods are "relatively simple procedures that in most cases are not supported by an extensive body of statistical literature." They consider cluster analysis methods to be simply "rules of thumb" so cluster solutions, and accompanying labels, should not be reified. Researchers must make their own decisions about whether types produced from a cluster analysis are "real" and not simply imposed by the method. In fact, Aldenderfer and Blashfield explain that different clustering methods can generate different solutions with the same dataset; therefore, adequate evidence of the validity of a cluster analysis must always be presented.

Bailey (1994) offers three ways to statistically evaluate typologies: replication, significance tests on external variables (predictive validity), and Monte Carlo procedures. Replication, or reliability, can be accomplished by using the same cluster method but with different samples, and then examining the number of the clusters obtained and their composition. The split-half method is commonly employed by dividing the same sample randomly into two equal parts (Bailey, 1994). Significance tests on variables not used in the original cluster analysis, but which are logical outcomes of the process, allow for determination of whether the types actually differ in

predictive validity. Monte Carlo procedures generate random numbers for an artificial dataset with the same characteristics as the original dataset. The same clustering method is then used on the artificial dataset as the original dataset, and results are compared.

Using qualitative criteria of a quality typology as a basis for comparing typologies can complement quantitative approaches. Rich (1992) created one of the most extensive and well-articulated list of criteria for a quality typology. He based the criteria on three characteristics of a quality typology:

1) describes reality in a way that is recognizable and consistent with the vision of theorists and practitioners;
2) demonstrates logical and consistent relationships between selected parts of the unit of study and the whole unit;
3) comprehensive in its description of units of all types.

Based on these characteristics, Rich (1992) suggested the following criteria for a quality typology: breadth, meaning, depth, theory, quantitative measurement, completeness and logic, and recognizability (Table 11). Using these characteristics to qualitatively assess typologies has been shown to be valuable, identifying potential issues with typologies that may otherwise be considered sound (e.g., Eppler, Hoffmann, and Pfister, 2011).

Research Questions

The landowner typology literature could benefit from comparative assessments of the quality of landowner typologies. The objective of this paper is to demonstrate the utility of three assessment approaches to evaluate three different landowner typologies. To evaluate the typologies, I used (1) replication through split-halves, (2) predictive validity in locating landowners for EOC and for creating effective EOC programs, and (3) qualitative evaluation

criteria. The three typologies were created with unique sets of variables: behaviors, ownership motivations, and reasoned action cognitions that predict behavior intentions (i.e., attitudes, norms, and perceived behavioral control).

Specifically, this paper addresses the following research questions:

1) How do the three typologies (i.e., behavior, ownership motivations, reasoned action cognitions) differ in their categorization of respondents?

2) Which typology demonstrates the highest reliability through a split-halves approach?

3) Which typology demonstrates greatest predictive validity through external variables (specifically those useful for locating landowners for EOC and for creating effective EOC programs)?

4) Which typology most closely aligns with criteria for quality typologies (i.e., breadth, meaning, depth, theory, quantitative measurement, completeness and logic, and recognizability)?

Methods

An Application: Early Successional Forest Habitat in New York

To compare the three typologies (i.e., behavior, ownership motivations, cognitive), I utilized survey data from a regional study of landowners in New York. The landowner study focused on the Southern Tier of New York State, where the creation of early successional forest habitat (ESH) is a priority for wildlife habitat conservation (NYS DEC, 2006). The counties in the study area included Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Cortland, Tioga, Broome, Chenango, Otsego, and Delaware.

Landowner Survey

Data Collection. Data were collected from November 2010 - January 2011 using a mail survey instrument following a modified Tailored Design Method approach (Dillman, Smyth, &

Christian, 2009). The approach consisted of four mailings: cover letter and questionnaire, reminder postcard, cover letter and replacement questionnaire to non-respondents, and reminder postcard to non-respondents. After the initial mailing, follow-up mailings were conducted at regular intervals at a maximum of two weeks apart.

I sent the survey to a random sample of landowners with at least 10 acres of land in at least one contiguous parcel in the Southern Tier. To ensure an adequate sample with large landholdings, I created a sampling frame for those with 50 acres or more and for those with 50 acres or less. From each sampling frame, surveys were mailed to 1250 potential respondents (2500 total landowners). The sample was drawn from tax code records obtained from the New York Department of Taxation and Finance Office of Real Property Tax Services, limiting selection of participants to those with tax codes that would contain PFL's. For more information on sampling, see Dayer, Allred, Stedman, Enck, and Kurth (2011). The research was reviewed under protocol 1006001472, by the Cornell University Office of Research Integrity and Assurance, and qualified for Exemption from the Institution Review Board.

In total, 1036 individuals responded to the survey (521 from the 10-49 acre strata; 514 from the 50 or more acre strata). After accounting for undeliverable mailings, the overall response rate was 43%. For the purpose of the analysis, the landowner samples were combined. It was not possible to weight the sample for acreage, as many respondents owned more than one parcel, and a population estimate was unavailable for total acreage (see Appendix B).

To identify any non-response bias, a telephone survey non-response check was administered by the Survey Research Institute at Cornell University to a random sample of 50 non-respondents from each stratum (10-49 acres and 50 or more acres). To allow for comparison between respondents and non-respondents to the mail survey, the telephone survey included a

subset of items (land characteristics, preferences for land characteristics, attitudes, ownership motivations, beliefs, cutting behavior, gender, age, and education) from the mail survey. T-test and chi-square tests revealed that the respondents and non-respondents had statistically significant differences on two land characteristics, several motivations, behavioral intentions, and education level. However, the effect size of all of these differences were minimal (Vaske, 2008), so the respondent sample was not weighted (see Appendix B).

Survey Items. The instrument examined landowner past behavior and behavioral intentions to create a patch-cut: "cutting a patch of trees [at least a ½ acre] where all or most of the trees were removed [to open the canopy] and then plants and trees were allowed to grow back". Past behavior was measured as conducting the activity in the past ten years ("yes" or "no"). Behavioral intention was measured as likelihood to conduct the activity in the next five years ("not at all likely", "slightly likely", "moderately likely", or "very likely").

The survey instrument also measured ownership motivations by asking how important each "reason you own your land" was to respondents (e.g., "for hunting and fishing"), from "not at all important" to "very important." Attitude was assessed with two five-point Likert scale items (e.g., "very bad" to "very good") addressing whether they believed the behavior was "bad or good" for (1) their land and (2) wildlife. One item assessed perceived norm by asking respondents "how common it is that other landowners in your areas do this activity" and offering response options on a four-point scale from "not at all common" to "very common." Respondents were also given an option to select "don't know." Perceived behavioral control was assessed by one four-point scale item "to what extent do you feel you are able to get the following activity done on your land [if you decide to do so]?" to which they could respond from "not at all able" to "very able". Landowner characteristics such as gender, residence, and

organizational membership, were also included in the survey.

Analysis

Analyses were conducted with SPSS 19.0. All respondents who selected "don't know" on the norm item were removed from the analyses, as well as any respondents who did not answer this item, the attitude, the perceived behavioral control, or behavioral intention items. The resulting sample included 673 respondents.

Creation of typologies. Three typologies were created, each via a unique set of variables. The *behavior-based typology* was created by assigning participants to one of four categories based on their responses to two items about their past and future adoption of patch-cutting: 1) those who have never conducted patch-cuts in the past and have no likelihood of doing so in the future; 2) those who have conducted patch-cuts in the past and have no likelihood of doing so in the future; 3) those who have never conducted patch-cuts in the past but report at least a "slight" likelihood to do so in the future; and 4) those who have conducted patch-cuts in the past and report at least a "slight" likelihood to do so in the future. To design the *motivations typology*, I used the 11 ownership motivation variables. I utilized a common method for segmentation in landowner typology research (Finley & Kittredge, 2006): 1) data reduction using principal components analysis (with varimax rotation) to create factors where necessary (i.e., motivations) and 2) segment formation using cluster analysis. For the *reasoned action typology*, I also formed segments using cluster analysis, but using variables drawn from the RAA (attitude, norm, and perceived behavioral control), as described above (see survey items). For both of the latter typologies, I first conducted a hierarchical analysis (Ward's method) to determine the number of clusters from the dendogram and then conducted a k-means cluster analysis (Butler et al., 2007).

Comparison of typology assignment. To compare the extent to which typologies overlapped in their categorization of respondents, I conducted a cross-tabulation analysis. I compared the percent overlap in landowner assignment of each of the types in a given typology with types in the other typology to determine whether the typologies similarly assigned landowners to types.

Reliability. To assess reliability, the sample was randomly divided in two. For the behavior-based typology, I compared the percentage of landowners in each type found in each half and found in the full sample using Chi-square. For the motivations and reasoned action typologies, I ran k-means cluster analysis again to determine whether clusters would have the same characteristics. Then, if they did, I compared the percentage of landowners in each type found in each half and found in the full sample using Chi-square.

Predictive validity through external variables. Scales (composite variables created by summing responses and then dividing by the number of items) for organizational membership were created and then assessed for reliability with Cronbach's alpha. Each of the types was compared on the external variables (gender, rural, organization membership, and interest in future information about wildlife habitat on their land) using Chi-square or ANOVA with Scheffe post-hoc analysis to compare group differences. These socio-demographic external variables were selected given their utility in identifying or finding landowners for outreach.

Assessment through quality characteristics. Lastly, I qualitatively assessed each of the typologies according to Rich's (1992) criteria for a quality typology: breadth, meaning, depth, theory, quantitative measurement, and completeness and logic (for definitions, see Table 11). I noted each typology's strengths and weaknesses on each criterion.

Results

Characterizing Composition by Types

For the *behavior–based typology* (Table 3.2), landowners were divided into four types of patch-cut adopters based on their past behavior and likely future behavior: 1) "Non-adopters" (had not conducted patch-cuts in the past ten years nor do they intend to in the future; 39%), 2) "Potential adopters" (had not conducted patch-cuts but have some intention to do so in the future; 28%), 3) "Past adopters" (had conducted patch-cuts but do not have an intention to do so in the future; 5%), and 4) "Continuing adopters" (had conducted patch-cuts and have some intention to do so in the future; 28%). It should be noted that subsequent statistical analyses could be sensitive to the low cell count of Past adopters.

Table 3.2. Behavior adoption types based on past and future adoption of patch-cutting behavior.

	Likelihood of future adoption of patch-cutting behavior	
	No Future Likelihood n (%)	Future Likelihood[1] n (%)
No Past Patch-cut Behavior	"Non-adopter" 254 (39%)	"Potential adopter" 180 (28%)
Past Patch-cut Behavior[2]	"Past adopter" 33 (5%)	"Continuing adopter" 182 (28%)

[1] Those who reported at least a "slight" likelihood to cut patches of trees of at least ½ acre in the next 5 years.
[2] Those who reported they had cut patches of trees of at least ½ acre on their property in the last 10 years.

For the *motivations-based typology*, three ownership motivation factors emerged from patterns of response to the survey items. These included consumptive motivations (land investment, selling timber products, hunting/fishing); living off the land motivations (personal use of timber products, non-timber forest products, farming); and non-consumptive motivations (enjoy scenery, protect nature, wildlife habitat, privacy, birdwatching). The Cronbach's alpha

indicated the motivations scales were reasonably reliable for living off land (0.59) and non-consumptive motivations (0.77). The consumptive motivations (0.43) scale was not reliable, but it demonstrated face validity (items logically relate to the core construct of interest) and is retained for analysis. Despite its face validity, the lower reliability can result in weaker prediction with this scale.

The dendogram from the hierarchical cluster analysis using these three motivations factors suggested three types of landowners. A k-means cluster analysis revealed that all types found non-consumptive motivations important. The primary distinction between the clusters was whether they also found consumptive motivations important or living off the land motivations as well as consumptive motivations (see Table 3.3). I refer to the three types as: "Preservationist" (41%), "Utilitarian" (26%), and "Homesteader" (33%).

Table 3.3. Final cluster centers (means in k-means analysis) for motivations-based typology, including motivations factors.

		Motivations Factors		
Landowner Motivations Types	n (%)	Non-consumptive Motivations[1] *M*	Living off Land Motivations *M*	Consumptive Motivations *M*
"Preservationists": Only non-consumptive	259 (41%)	3.15	1.62	1.85
"Utilitarians": Non-consumptive and consumptive (but not living off)	163 (26%)	3.23	1.56	3.09
"Homesteaders": All motivations	204 (33%)	3.38	2.85	2.96

[1]Motivations items were measured on a four-point scale: not at all important (1), slightly important (2), moderately important (3), and very important (4). Mean scales were created for factors of typology items, including consumptive motivations (land investment, selling timber products, hunting/fishing); living off the land motivations (personal use of timber products, non-timber forest products, farming); and non-consumptive motivations (enjoy scenery, protect nature, wildlife habitat, privacy, birdwatching).

For the *reasoned action-based typology*, I used the attitudes scale about the benefits of cutting for wildlife and land (Cronbach's alpha=0.86), norms item (cutting norm), and perceived behavioral control item (ability to conduct cutting activity if decided to do so) item in the hierarchical analysis. The dendogram suggested creating four types of landowners. A k-means cluster analysis set for four clusters revealed types were most distinguished by their attitudes and perceived behavioral control (see Table 3.4). I refer to the four types as: "Doer" (26%); "Neutral" (22%); "Observer" (30%); and "Rejecter" (21%). The "Doer" type included individuals who have a positive attitude toward cutting patches and high perceived behavioral

control about their ability to cut patches. In contrast, the "Rejecter" type had a negative attitude toward cutting patches with high perceived behavioral control. The individuals in the "Neutral" type expressed neutral or weak attitudes, norms, and perceived behavioral control. Those in the "Observer" type were the highest of the types on the norm measure and slightly positive or moderate on the other cognitions.

Table 3.4. Final cluster centers (means in k-means analysis) for a reasoned action-based typology, including attitudes, norms, and perceived behavioral control of landowners relative to the benefits of cutting for wildlife and land.

Reasoned Action Types	n (%)	Attitudes[1] *M*	Norms[2] *M*	Perceived Behavioral Control[3] *M*
"Doer": Positive attitude, high control (but low norms)	177 (26%)	4.25	1.49	3.54
"Neutrals": Neutral/slightly across the board	149 (22%)	2.81	1.75	1.56
"Observer": Positive attitude, moderate norm and control	203 (30%)	3.84	3.40	3.36
"Rejecter": High control (but low norm and negative attitude)	144 (21%)	2.31	1.73	3.74

1 Attitude was measured as a mean of two attitude items regarding landowners' perceptions of patch-cutting for their land and for wildlife on a five-point scale: very negative/very unnecessary (1), negative/unnecessary (2), neither (3), positive/necessary (4), very positive/necessary (5).
2 Norm (related to patch-cutting) was measured as four-point scale: not at all common (1), slightly common (2), moderately common (3), and very common (4).
3 Perceived behavioral control (ability to conduct cutting activities if a landowner decided to do so) was measured on a four-point scale: not at all able (1), slightly able (2), moderately able (3), and very able (4).

Comparison of Typology Assignment

Before evaluating the quality of the three typologies, I explored the extent to which they categorized landowners similarly. To do so, I conducted a cross-tabulation analysis to compare the percentage of overlap in landowner assignment to each of the segments in the three typologies (Tables 3.5, 3.6, and 3.7). While there were some notable similarities in the overlap of types, no two types together included more than 68% of the same landowners. A notable pattern in the comparison was Non-adopters, Potential adopters, and Past adopters were 1.5 to 2 times more likely to be Preservationists than other motivation types (Table 3.5). In contrast, Continuing adopters were more likely to be Homesteaders or Utilitarians than Preservationists. In comparing reasoned action types and behavior-based types (Table 3.6), similarities were even more pronounced, such as Neutral and Rejecter types were largely Non-adopters (60-68%). In contrast, 44% of Doer and Observer types were Continuing adopters. Similarly, 42% of Past adopters were Observers, but strikingly less in the Doer (18%) and Neutral (15%) types. Lastly, in comparing reasoned action types with motivations-based types (Table 3.7), approximately half of the Neutrals and Rejecter were Preservationists. With less distinction, Doer and Observer were nearly evenly split across the three motivations types. In summary, while there was some notable overlap in the types, the typologies largely classified landowners differently.

Table 3.5. Percentage of motivations types in each behavior type (top) and percentage of behavior types in each motivation type (bottom).

		Behavior Types				
		Non-adopter	Potential adopter	Past adopter	Continuing adopter	
Motivations Types	Preservationists	48% 50%	29% 43%	6% 48%	17% 25%	100%
	Utilitarians	29% 20%	30% 28%	5% 26%	35% 33%	100%
	Homesteaders	36% 30%	25% 29%	4% 26%	36% 42%	100%
		100%	100%	100%	100%	

Pearson Chi-square = 29.41; p<.001

Notes: In cases where the percentages in the table do not sum to 100%, it is due to rounding. Also, the percentage of motivations-based types in each behavior-based type is on the top of each row and percentage of behavior-based types in each motivations-based type is on the bottom. For example in Table 5, 48% of those classified by the Preservationists motivations type were Non-adopters, and 50% of the Non-adopter behavior type were Preservationists.

Table 3.6. Percentage of reasoned action types in each behavior type (top) and percentage of behavior types in each cognition type (bottom).

		Behavior Types				
		Non-adopter	Potential adopter	Past adopter	Continuing adopter	
Reasoned Action Types	Doer	21% 14%	31% 30%	4% 18%	44% 42%	100%
	Neutral	60% 33%	27% 21%	4% 15%	9% 7%	100%
	Observer	20% 15%	29% 32%	7% 42%	44% 48%	100%
	Rejecter	68% 37%	22% 17%	6% 24%	4% 3%	100%
		100%	100%	100%	100%	

Pearson Chi-square = 166.74; p<.001

Note: In cases where the percentages in the table do not sum to 100%, it is due to rounding.

Table 3.7. Percentage of reasoned action types in each motivation type (top) and percentage of motivation types in each cognition type (bottom).

		Motivations Types			
		Preservationist	Utilitarian	Homesteaders	
Reasoned Action Types	Doer	31% 20%	36% 37%	32% 27%	100%
	Neutral	54% 29%	15% 13%	31% 21%	100%
	Observer	37% 27%	28% 32%	35% 33%	100%
	Rejecter	47% 24%	22% 18%	31% 20%	100%
		100%	100%	100%	100%

Pearson Chi-square =26.46; p<.001
Note: In cases where the percentages in the table do not sum to 100%, it is due to rounding.

Evaluating the Typologies

Reliability via split halves. To evaluate the reliability of each typology, the sample was randomly divided in half and then the methodology for the creation of typologies was replicated for each half of the sample. First, the percent of each half of the sample in each of the four behavior-based types was compared (Figure 3.1). I found nearly the same distribution in each half with no significant difference between the distribution in the half samples and the full sample (χ^2=.83, *df*=3, *p* =.84). Next, I conducted k-means cluster analysis to again create three motivations types. Three similar types were found in both samples, and their cluster means were similar to the full sample (Table 3.8). Additionally, the percentage of landowners in each type differed by no more than 8% for each half of the sample (Figure 3.2). The Universal type had the greatest difference between the first and second halves (28% vs. 36%). The difference between the distribution in the half samples and the full sample was not statistically significant (χ^2=.48,

df=2, *p* =.79). Finally, I conducted k-means cluster analysis to again create four reasoned action types. Four similar types were found in both samples, and their cluster means were also similar to the full sample (Table 3.9). The percentage of the landowners in each type differed by no more than 6% for each half of the sample (Figure 3.3), with this difference being found in the halves of the Observers (28% vs. 34%). Again, the differences between the half samples and the full sample were not statistically significant (χ^2=.58, *df*=3, *p* =.90).

Figure 3.1. Percentage of landowners in each of the behavior-based types.

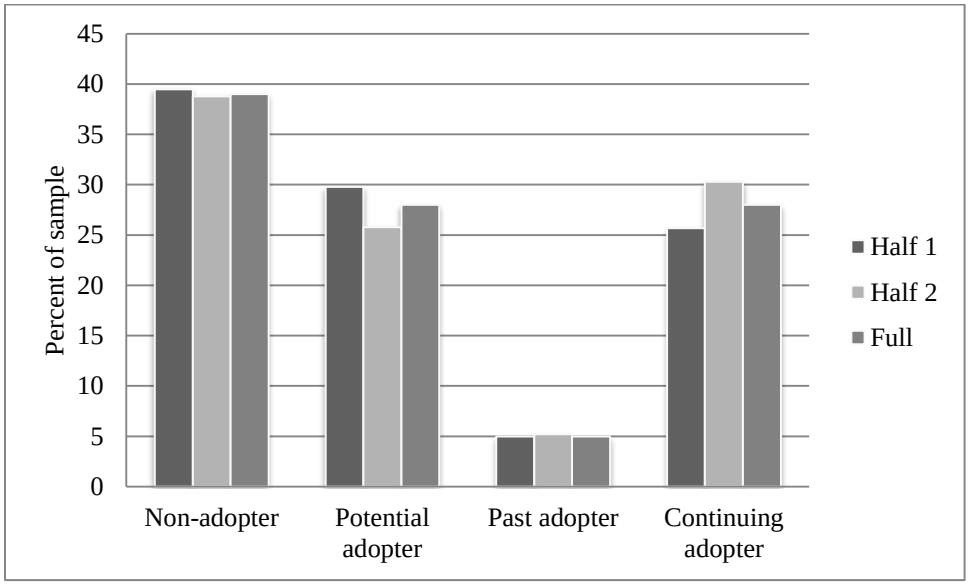

Figure 3.2. Percentage of landowners in each of the motivations types.

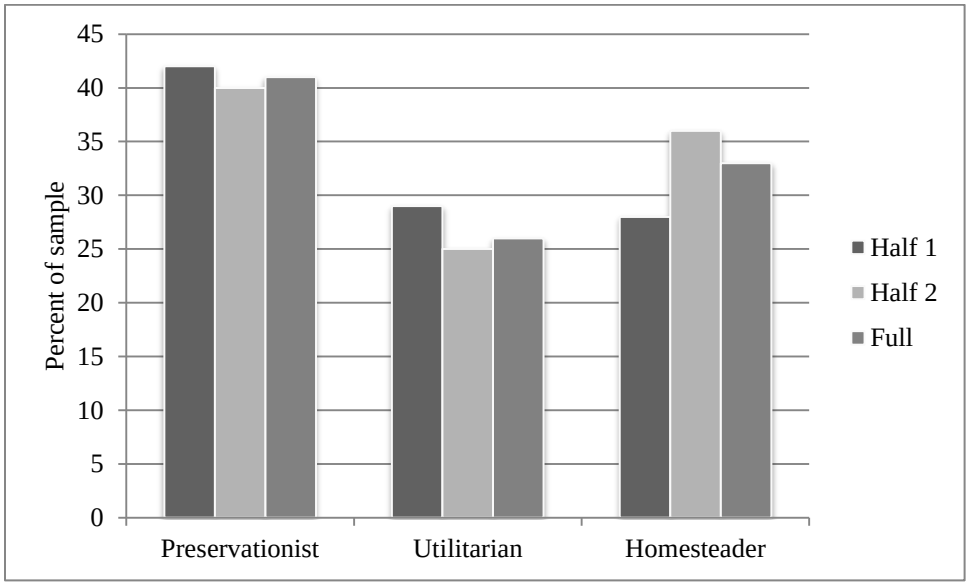

Figure 3.3. Percentage of landowners in each of the reasoned action types.

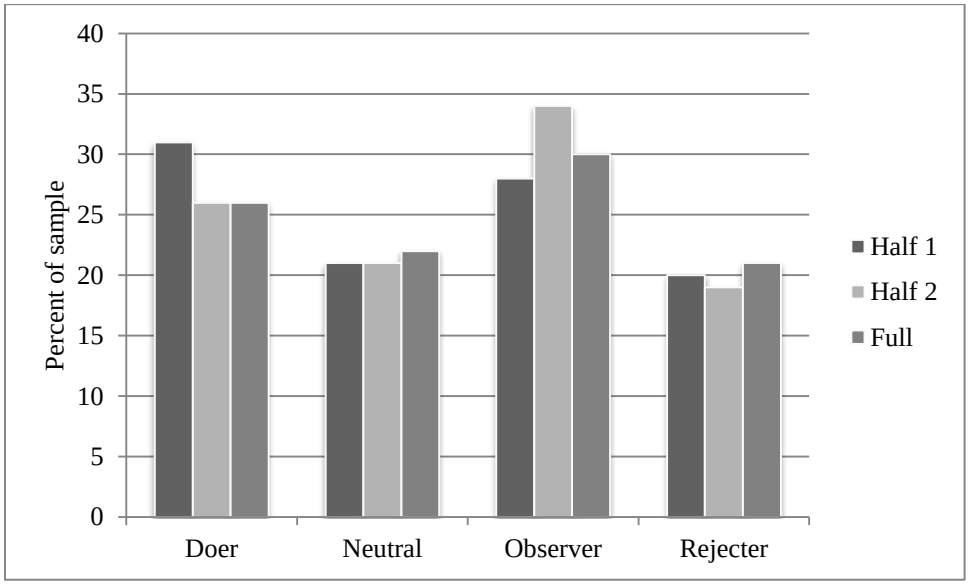

Table 3.8. Final cluster centers (means) in k-means analysis for split-halves for the three motivations types based on ownership motivations.

Motivations Types[1]			Non-consumptive Motivations			Living off Land Motivations			Consumptive Motivations		
Full	First half	Second half	Full	First half	Second half	Full	First half	Second half	Full	First half	Second half
Homesteader	Cluster 1	Cluster 3	3.38	3.38	3.40	2.85	2.86	2.86	2.96	2.93	3.01
Preservationist	Cluster 2	Cluster 2	3.15	3.09	3.20	1.62	1.66	1.62	1.85	1.84	1.85
Utilitarian	Cluster 3	Cluster 1	3.23	3.23	3.21	1.56	1.60	1.49	3.09	3.05	3.07

1 Motivations measured on a four-point scale from not at all important to very important.

Table 3.9. Final cluster centers (means) in k-means analysis for split-halves for the four reasoned action types based on the Reasoned Action Approach.

Reasoned Action Types			Attitudes[1]			Norms[2]			Perceived Behavioral Control[3]		
Full	First half	Second half	Full	First half	Second half	Full	First half	Second half	Full	First half	Second half
Doer	Cluster 1	Cluster 3	4.25	4.25	4.33	1.49	1.67	1.49	3.54	3.56	3.57
Observer	Cluster 2	Cluster 4	3.84	3.44	3.82	3.40	3.40	3.42	3.36	3.10	3.45
Neutral	Cluster 3	Cluster 1	2.81	2.88	2.76	1.75	1.59	1.78	1.56	1.49	1.61
Rejecter	Cluster 4	Cluster 2	2.31	2.38	2.31	1.73	1.63	1.59	3.74	3.75	3.74

1 Attitude was measured as a mean of two attitude items regarding landowners' perceptions of patch-cutting for their land and for wildlife on a five-point scale: very negative/very unnecessary (1), negative/unnecessary (2), neither (3), positive/necessary (4), very positive/necessary (5).
2 Norm (related to patch-cutting) was measured as four-point scale: not at all common (1), slightly common (2), moderately common (3), and very common (4).
3 Perceived behavioral control (ability to conduct cutting activities if a landowner decided to do so) was measured on a four-point scale: not at all able (1), slightly able (2), moderately able (3), and very able (4).

Predictive validity through external variables. To explore the predictive validity of the typologies, each of the typologies was compared on variables that have been shown in previous research to be useful for identifying landowners (gender, rural residence, and organization membership) or understanding their interest in receiving outreach information in the future. First, mean scales for organizational membership were created. Game wildlife organizations included National Wild Turkey Federation, Pheasants Forever, Quality Deer Management Association, and Ruffed Grouse Society. Non-game wildlife organizations included Audubon, Cornell Lab of Ornithology, National Wildlife Federation, and The Nature Conservancy.

None of the typologies showed significant differences among types on membership in non-game organizations (Table 3.10). This variable had a low mean for all types (0.04 to 0.07 on a 0 to 1 scale). For most of the other variables, at least one type in each typology differed significantly from the other types. There were differences among the behavior-based types on all of the other variables except interest in more information. Generally, the Non-adopters were most like Past adopters (i.e., both types had a higher percentage of females than the other types, and were less likely to be members of game organizations), and the Potential adopters were most similar to Continuing adopters (i.e., fewer females). The exception to this pattern was on game wildlife organization membership, in which Continuing adopters had at least three times the membership of all the other types. Potential adopters also stood out as the least rural of the four types.

Motivations types also differed on all variables except non-game wildlife organization membership and interest in more information (Table 3.10). Preservationists included a higher proportion of females than the other two types. For rural residence, the differences were marked. Utilitarians were the least rural and most suburban of the types. Homesteaders were most rural

of the three types at 91%. Preservationists were the most urban but still at only 11%. Utilitarians were more likely to be members of game organizations than Homesteaders and Preservationists.

Table 3.10. Chi-square and ANOVA results for typologies by landowner characteristics and interest in more information.

	Behavior-based Types	Motivations Types	Reasoned Action Types
Percentage female	Non-adopter – 17% Potential – 12% Past – 22% Continuing – 7% Pearson Chi-square = 11.38**	Utilitarian – 8% Homesteader – 10% Preservationist – 18% Pearson Chi-square = 11.29*	Doer – 4% Neutral – 22% Observer – 16% Rejecter – 12% Pearson Chi-square = 23.88***
Rural residence (% of urban/suburban/rural)	Non-adopter – 11%/13%/76% Potential – 6%/25%/69% Past – 10%/16%/74% Continuing – 5%/17%/78% Pearson Chi-square = 14.47**	Utilitarian – 9%/28%/63% Homesteader – 3%/7%/91% Preservationist – 11%/18%/70% Pearson Chi-square = 45.33***	Doer – 8%/19%/73% Neutral – 6%/16%/78% Observer – 8%/23%/70% Rejecter – 10%/12%/78% Pearson Chi-square = 8.02
Non-game organization members (means[1])	Non-adopter – 0.05 Potential – 0.04 Past – 0.07 Continuing – 0.06 F = 0.37	Utilitarian – 0.06 Homesteader – 0.04 Preservationist – 0.05 F = 1.06	Doer – 0.04 Neutral – 0.04 Observer – 0.07 Rejecter – 0.05 F = 1.10
Game organization members (means[1])	Non-adopter – 0.01 Potential – 0.03 Past – 0.02 Continuing – 0.10 F = 14.80***	Utilitarian – 0.07 Homesteader – 0.04 Preservationist – 0.02 F = 5.52**	Doer – 0.06 Neutral – 0.02 Observer – 0.06 Rejecter – 0.02 F = 5.67**
Percentage interested in more information	Non-adopter – 60% Potential – 65% Past – 63% Continuing – 71% Pearson Chi-square = 5.72	Utilitarian – 63% Homesteader – 64% Preservationist – 67% Pearson Chi-square = 0.80	Doer – 77% Neutral – 57% Observer – 68% Rejecter – 54% Pearson Chi-square =25.44**

[1] Organization membership measured as 1 = member and 0 = nonmember.
* p<.05; ** p<.01; ***p<.001

Lastly, the reasoned action typology differed from the other typologies in that it distinguished interest in more information but not rural residence. All of the cognition types had roughly the same proportion of urban, suburban, and rural residing landowners, whereas Doer and Observer types were more interested in receiving information than were the Neutral and Rejecter types. Also compared to the other typologies, the reasoned action typology showed a greater range among types for gender (Table 3.10). Neutrals were more likely to be females than the other types, particularly the Doer type. Rejecter and Neutrals were least likely to be game organization members.

In summary, each of the typologies demonstrated predictive validity on most of the variables. The variables predicted by the typologies were the same for the behavior-based and motivations-based typologies, with the reasoned action typology uniquely offering predictive validity on interest in information. Notably, often the differences predicted by the typologies were not across all types but just one or two of them.

Assessment through quality characteristics. Lastly, I qualitatively assessed each of the typologies according to Rich's (1992) criteria for a quality typology (breadth, meaning, depth, theory, quantitative measurement, completeness and logic, recognizability; Table 3.11). I noted each typology's strengths and weaknesses on each of the criteria.

All three of the typologies were strong on their "breadth" and "quantitative measurement" approaches (Table 3.11). None of the typologies fully met all criteria, but the behavior-based typology most nearly did so, only lacking in the "depth" criterion. While the behavior-based typology was based on empirical data (using the same survey dataset as the other two typologies), it was not based on a multivariate method, which is the second component of the definition of this criterion. A multivariate method is thought to be better because it allows

for more variables and complexity, which is more like the variety found in real-life phenomena. Recall that the behavior-based typology was created by simply crossing responses to two items (past behavior and future behavior).

Table 3.11. Qualitative assessment of typologies based on quality characteristics (Rich, 1992).

	Behavior	Motivations	Reasoned Action
Breadth: define the process for character selection and creation of types.	Cross-tabulation for types based on past & future behavior*	Cluster analysis with motivations factors*	Cluster analysis with three RAA model variables *
Meaning: builds upon a philosophical foundation that explains the basis for classification, provides meaning in the broad social context, and supports use of the classification.	Built on foundation of behavior as key variable for understanding landowners' management and to segment "markets"*	Built on long history of landowner research based on motivations and also typology research on landowner motivations*	Built on basis that social psychological variables can be used to understand behavior; challenging in broader social context as reasoned action cognitions not well known or recognized
Depth: basis for classification of units is multivariate analysis with empirical data	Crosstabulation with two survey variables defines monothetic types	Cluster analysis with survey data*	Cluster analysis with survey data*
Theory: either based in theory or creating theory in the process, the theory provides a qualitative basis for determining variables and boundaries between types.	Adoption of behavior theory defines variables and boundaries*	Landowner theory defines variables, but not the factors and does not define boundaries between types	RAA theory defines variables but does not define boundaries between types
Quantitative measurement: numerical procedures and multivariate data analysis with these numbers define placement of units into types.	Cross-tabs numerical procedure based on survey data*	Survey data on motivations used for data analysis*	Survey data on cognitions used for data analysis*
Completeness and logic: thorough and detailed and comprehensive, with all units in the study sample; additionally, each unit in a type should have a logical and consistent relationship with each other and each type should also have a similar relationship to other types	Covers all units; logical and consistent relationships*	Covers all units, but NOT fully logical and consistent relationships with units in other types	Covers all units, but NOT fully logical and consistent relationships with units in other types
Recognizability: classification should mirror the real world for practitioners and theorists.	Recognizable for both*	Very recognizable for theorists in forest landowner research and possibly practitioners	Very recognizable for theorists in social psychology but not practitioners

*Denotes that the typology appears to fully meet the criteria, according to definition by Rich (1992).

The motivations typology and reasoned action typology both lacked on the "theory" and

"completeness and logic" criteria (Table 3.11). On the "theory" criterion, the two typologies were strongly grounded in theory, which informed which variables were used. Yet, they were considered weak according to the criteria in that theory did not specify boundaries between the types as well. Instead, the boundaries were established empirically with the hierarchical cluster analysis followed by the k-means cluster analysis. These methods assign landowners to types, and determine which factors define a type. After analyzing the resulting types, it is clear that the differences would not have been predicted by theory. This challenge with the boundaries between types also resulted in the weaknesses of the motivations and reasoned action typologies in the "completeness and logic" criteria. The types within a typology had overlap on the variables that composed it, given how the cluster analysis results find cluster centers. Further, each landowner in a type was not completely consistent and uniform on each variable composing the type. The landowners also could not easily be "retrieved" (or determined as to which type a landowner is in) as the cluster method does not provide the low and high values on each variable that composes it. Instead, landowners were assigned to types based upon the cluster into which they fell. These issues would be experienced by any typologies developed using cluster analysis and indeed are common to many statistical methods.

The motivations typology and reasoned action typology were less likely to be "recognizable" by practitioners and/or theorists compared with the behavior-based typology (Table 3.11). In other words, a practitioner or theorist may not be able to understand what the types mean without extensive explanation of their characteristics. Depending on the theorists' backgrounds, the typologies may or may not have face validity. If a theorist came from a social psychology background he would likely be familiar with reasoned action cognitions, and if he came from a forest landowner research or human dimensions of forestry background, he would

likely be familiar with ownership motivations, but not the converse. Further, reasoned action cognitions would clearly be unknown to practitioners without some training in social psychology, given that concepts of norms, attitudes, and perceived behavioral control are not commonly understood by those outside the field. In contrast, motivations may or may not be familiar, depending on whether the practitioner works frequently with landowners and discusses why they own their land. Additionally, even if the theory and concepts were known, it is very challenging to identify and locate landowners with given cognitions or motivations.

Discussion

Aside from predictive validity, PFL typologies have not been assessed for their reliability and quality before their application. I demonstrated how multiple methods for assessment can be useful with three distinct typologies created with unique sets of variables. Using these methods, no typology stood out as better than the other typologies according to reliability and predictive validity assessment approaches. The newly proposed reasoned action typology performed no better than behavior-based and motivations-based typologies, which were based on long-standing approaches. For each typology, the replication through split-halves led to the same general characteristics for the typology, indicating high reliability. While this was likely to happen with the behavior-based typology due to the approach for its creation (i.e., cross-tabulation of two variables), it was hardly predetermined for the motivations and reasoned action typologies that were created through cluster analysis (and could thereby have different characteristics). Furthermore, all three typologies showed nearly the same distribution of landowners across the types in each half. In the motivations-based and reasoned action-based typologies, at least 20% of the sample made up each type. This was not the case for the behavior-based typology, which had one type (Past adopter) with only 5% (n = 33). While this is a limitation for being able to

generalize results for this type, it is also important information on its own: very few landowners have tried the behavior and determined that they would not do it again.

Similarly, none of the typologies stood out as having better predictive validity through important external variables; each typology had significant differences for three of the five tested variables. Despite the similar proportion of variables with differences in the predictive validity assessment, two of the differences (related to residence and interest in information) have practical importance. The behavior and motivations typologies differed based on rural residence. Residence can be a relatively easy variable to use in implementing different education, outreach, or communications (EOC) programs (e.g., one can target educational or promotional materials in a rural area or offer a workshop in an urban area). Yet, despite the significant differences, for all types the percentage in a rural area was at least 69%. This is not surprising given the full sample is mostly rural. Probably the most useful information from this analysis is that one type has 91% in rural areas (Homesteaders). Using this information, an EOC professional who is developing a program that is aiming to reach this type would find them in a rural area. Also notably, only the reasoned action types differed on their interest in more information. This could prove useful in determining what the response to a future EOC program will be among the types. If only half of a type is interested in receiving more information, it would be wise to consider whether developing an EOC program for this type (Rejecter) would be cost-effective. Instead, a program developer might consider whether another type of intervention, for example a financial incentive program, might work better for the type.

While Rich (1992) does not explain how to apply his criteria for representative and rigorous typologies in comparing typologies, I found some obvious differences among typologies with my qualitative approach to applying these criteria. The behavior-based typology stood out

as the best according to Rich (1992) because it met nearly all of the criteria. The motivations and reasoned action typologies were not as strong on the "theory" and "completeness and logic" criteria. This distinction is due to the determination of types within typologies being based on cluster analysis as opposed to theory defining the boundaries between types and those boundaries being clear and distinguishable. This would be an issue with any typology created through cluster analysis. It additionally, reflects the trade-off that commonly occurs in social science research between empirically based or theory-based outcomes. While Rich (1992) acknowledges this potential issue, stating that cluster analysis "can be manipulated to form groups of many kinds," he affirms that he believes theory must "remain central to the classification process as the decider and arbiter of boundaries." However, Rich does not expand upon this statement, sharing how one might still define the boundaries. Thus, without guidance, researchers must consider whether this part of the theory criterion is appropriate for application in landowner typology research, which is largely based on cluster analysis methodology in the last decade. I suggest that while these criteria were useful for consideration of typology quality, it would be appropriate to adapt them when applying the criteria to typologies created through cluster analysis. The component of the theory criterion that theory must serve as the "basis for boundaries between types" should be disregarded, as well as the component of the completeness and logic criterion that "each unit in a type should have a logical and consistent relationship with each other and each type should also have a similar relationship to other types."

Conclusion & Future Research

My mixed methods evaluation approach brings together for the first time several of the best available techniques, with findings demonstrating that thorough consideration of typology options is worthwhile. If I had considered only predictive validity through external validation of

variables, which is the most common approach in the landowner typology literature, I would have had inconclusive results of each typology only showing quality by three of the five variables. Instead, a more complete picture is available through studying reliability and quality as well. While all of the typologies generally fared well in their assessment, these approaches indicate that no one typology is clearly the best. Within one sample of landowners I have found three typologies that are nearly equivalent in their assessment results overall, though different in the specific results (i.e., particular landowner classifications) they return. This finding should serve as a strong caution to landowner typology researchers against presenting a typology as the typology for a given sample. This is particularly important with the cluster analysis solutions that inherently require judgments by the researcher in creating a typology (Aldenderfer & Blashfield, 1984), but also for those using more basic methods like our behavior-based typology.

Instead, I recommend that researchers more thoroughly consider various options for typologies in a given sample and their associated strengths and weaknesses based on the assessments. For example, the new reasoned action typology I created is best for determining differences in interest in receiving more wildlife-related information, which could be an important characteristic when deciding how to move forward with EOC program development. However, the issue of this typology being difficult for practitioners to recognize, due to its basis in less familiar psychological concepts and those concepts being hard to identify in the field, would need to be overcome.

As the next step in comparing and evaluating typologies, I recommend evaluating the practical application of these typologies through field research. While more cost and time intensive than the assessment approach I have presented, such evaluation is arguably important. I suggest that future research in this area follow experimental design methods. A pre-intervention

survey, such as the one conducted in this study, could identify types of landowners, how to reach the various types, what type of EOC programs to develop for various types, and also provide baseline measures of attitudes and behavioral intentions. The results of the survey should then guide an EOC program intervention to an intervention group, as well as non-targeted EOC to a control group. Then a post-intervention survey could determine the effectiveness of this typology-based approach. Given researchers' continued suggestions that these typologies will be useful for landowner EOC, it is due time for assessing the value of typologies for locating landowners for EOC and developing EOC programs that better meet the needs of landowners.

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CHAPTER FOUR: DEVELOPING TOOLS TO ENCOURAGE PRIVATE FOREST LANDOWNERS TO PARTICIPATE IN EARLY SUCESSIONAL FOREST HABITAT MANAGEMENT

Abstract

Private forest landowners have a considerable role to play in wildlife habitat conservation. Thus, public wildlife agencies and wildlife conservation organizations often aim to engage private landowners in activities that will enhance wildlife habitat. In the northeastern U.S., early successional forest habitat (ESH) conservation through timber management is an oft-promoted private lands priority by these agencies and organizations. Landowner typology research can provide agencies and organizations with suggestions for how to engage landowners with diverse interests and preferences in forest management that benefits wildlife. In typology research, a population of landowners is segmented into different "types." Preferences for education or outreach are often identified, and suppositions are made about what would resonate with different types of owners. In this study, I explored how landowner typologies (based on behavior adoption, motivations, or cognitions from the Reasoned Action Approach) can be used to inform the selection of "tools of public action" for ESH management. Tools of public action are mechanisms and strategies employed by organizations or agencies to encourage people to engage in a behavior that addresses a public problem. A mail survey sent to a random sample of 2,500 landowners in New York State had a response rate of 43%. Three tools of public action were assessed: (1) basic needs (e.g., financial assistance), (2) learning (e.g., education about wildlife benefits), and (3) social support (e.g., timber management becomes more common). I found that across all types and typologies, learning tools were most likely to influence landowner behavior, whereas social tools were the least likely. Continuing adopters were the only type that reported that they would be influenced by basic needs tools at the same level as learning tools.

Additionally, in each typology certain landowners were consistently more likely to be influenced by all of the tools of public action. These landowners were already most likely to participate in the ESH management behavior in the future. Thus, these tools may be reinforcing behaviors of those already undertaking them, rather than reaching new audiences. Based on my results, I suggest that learning tools be initially prioritized by agencies and organizations interested in engaging landowners in ESH management. Basic needs tools may become more relevant once landowners become more familiar with the behavior and its benefits.

Introduction

Private forest landowners (PFLs) can greatly impact wildlife habitat conservation in the United States. Eighty percent of wildlife habitat is on private land, whereas 66% of the landcover of the U.S. is privately owned (Benson, 2008). Thus, programs and policies often are created to engage private landowners in activities that will result in the creation or maintenance of wildlife habitat on their lands. In the northeast U.S., a top wildlife conservation priority among natural resource agencies and organizations is creation and maintenance of early successional forest habitat (ESH) through management on private lands (Dettmers & Rosenberg, 2003; Hartley, 2007; Kelley Jr. & Williamson, 2008; Litvaitis, 2003; North American Bird Conservation Initiative, 2009). ESH, also known as shrubland and young forest, is characterized by persistent shrubs or seedling-sized to sapling-sized trees that are typically a response to some form of natural and human-induced disturbance (Litvaitis, 2003). Even-aged timber management,[4] resulting in timber harvest and subsequent regeneration, can create this type of habitat. State and federal agencies and non-governmental organizations are therefore interested in supporting landowners who engage in timber management for ESH conservation. With tight budgets, these

[4] Even-aged management includes silvicultural techniques such as clearcutting, shelterwood, seed-tree, and group selection (Chambers, 1983).

agencies and organizations ask themselves: *How do we invest our limited conservation program dollars to effectively and efficiently encourage landowners to create and maintain ESH on their lands? How do we address the heterogeneity of landowner preferences in our initiatives?*

Little research has addressed what types of initiatives might be most effective for engaging landowners in ESH conservation. Whereas past human-dimensions research regarding ESH has been limited (Gobster, 2001), some recent work has focused on attitudes and knowledge of landowners related to ESH. In a study of the Northern Forest region of the northeast U.S., more residents (37%) preferred late-successional to early-successional stages of forest than the reverse (12%), with about half considering them the same (Enck & Brown, 2006). Additionally, residents were largely unaware that ESH is declining in the study region (Enck & Odato, 2008). One qualitative study explored possible approaches to engaging PFLs in management for ESH (Christoffel & Case, 2010). In focus groups with PFLs in the northeast U.S., participants suggested education, network formation/maintenance, equipment rental/leasing, and tax relief as mechanisms to encourage PFLs to manage their land for ESH.

While not specific to ESH conservation, typology research has a long history of providing insights for how to most effectively and efficiently engage diverse types of PFLs in forest management (e.g., Tuttle & Kelley, 1981). In typology research, landowners have been segmented into "types" based on their adoption (or intended adoption) of a given land management behavior (e.g., Broderick, Snyder, & Tyson, 1996; Tuttle & Kelley, 1981), their ownership motivations (e.g., Butler et al., 2007; Majumdar, Teeter, & Butler, 2008; Ross-Davis & Broussard, 2007), and in some cases their attitudes and ownership motivations (e.g., Richter & Lewis, 2007). Researchers using landowner typologies suggest that targeting a diversity of landowners can more effectively engage landowners than just reaching "typical" or "ideal"

landowners (e.g., Butler et al., 2007; Hujala, Kurttila, & Karppinen, 2010; Salmon, Brunson, & Kuhns, 2002).

Typology researchers also have recommended "tools of public action" that would be most appealing to different types of owners. Tools of public action encourage action by members of the public to address a public problem (Salamon, 2002). An example of such a tool of public action is a cost-share incentive, which reimburses landowners for the costs associated with habitat management activities that benefit a species of rare wildlife. Whereas the preferences of the public are an important consideration in designing tools intended for public use (Bressers & O'Toole, 1998; Howlett, 2009), research has rarely tested such preferences empirically.

This paper addresses the gap in our understanding by exploring how landowner typologies can be used to inform what mix of tools of public action may most effectively engage different types of PFLs in ESH management in the Southern Tier of New York. Specifically, I will explore how typologies relate to expected effectiveness of tools for engaging landowners in habitat management, by considering landowner preferences for tools.

Literature Review

Tools of Public Action

Tools of public action (hereafter referred to as "tools") encourage or support people to engage in a behavior to address a public problem they might not have attempted to address otherwise (Bressers & O'Toole, 1998; Schneider & Ingram, 1990). Tools may be regulatory, market-based, or voluntary (Kauneckis & York, 2009). The name "tools of public action" (as opposed to a similar concept "policy tools") reflects that the delivery of the tools relies on more than governmental agencies; it includes collaboration with non-governmental organizations, industry, and/or private citizens (Salamon, 2002). Such collaboration has been shown to result in

greater forest landowner support for employing tools and taking action on their land (Jones, Gleridou, Dimitrakopoulos, & Evangelinos, 2012; Van Gossum, Arts, & Verheyen, 2012).

Multiple tools have been employed to encourage conservation on private lands (Casey, Vickerman, Hummon, & Taylor, 2006), including regulatory (e.g., government regulation, conservation compliance, financial penalty), voluntary incentives, property rights (e.g., conservation easements, stewardship exchange agreements), market-oriented institutions (e.g., user fees, ecotourism, tradable development rights), financial incentives (e.g., compensation, cost-share, leases, debt forgiveness), public tax incentives, and facilitative incentives (e.g., education, recognition).

Landowner Preferences for Tools

Although a variety of tools are available to influence PFLs' management and use of their forests, financial incentives often play a prominent role (Kilgore & Blinn, 2004; Kilgore, Greene, Jacobson, Straka, & Daniels, 2007). While some landowners are, in fact, motivated by financial incentives, others are not concerned about financial rewards (Daley, Cobb, Bromley, & Sorenson, 2004). In fact, research has shown that financial incentive programs may have limited influence on PFLs' management decisions and land use, with landowners preferring one-on-one access to forestry and natural resources professionals who could visit their land and discuss alternatives in the context of their specific property (Kilgore et al, 2007). Similarly, Schaaf and Broussard (2006) determined that PFLs prefer empowerment tools (learning, capacity building, symbolic, and positive incentives) to authority tools (regulations, sanctions/fines, and negative incentives).

Studies have addressed characteristics of PFLs that relate to their preferences for tools. More informed and educated landowners are more likely to accept tools in general (Serbruyns &

Luyssaert, 2006). Hadlock and Beckwith (2002) suggest that tools should be designed to specifically address the barriers to PFL participation. For example, financial incentives would be made available to landowners whose barriers are monetary. In contrast, Fischer and Bliss (2008) suggest a pairing of landowner motivations, rather than barriers, with appropriate tools. But they warn that this approach can be difficult to apply in practice, as many landowners have multiple and even conflicting motivations. In line with such an approach, landowner attitudes and motivations influenced support for tools (Janota & Broussard, 2008). Specifically, motivations for owning land, shared responsibility for land conservation, and awareness of impacts all helped to predict tool preferences. Similarly, Schaaf and Broussard (2006) found that timber-harvesting attitudes predicted support for empowerment-related policy tools.

Typologies

Typologies are classifications that "order… entities into groups or classes on the basis of their similarity" (Bailey, 1994, p.1). They maximize within-group homogeneity and, between-group heterogeneity. Landowner-typology research has primarily focused on typologies based on behavior (e.g., Broderick, Snyder, & Tyson, 1996; Tuttle & Kelley, 1981) or those based on ownership motivations (e.g., Butler et al., 2007; Majumdar, Teeter, & Butler, 2008; Ross-Davis & Broussard, 2007). Behavior-based typologies segment landowners according to their participation in management activities. Motivations-based typologies typically employ cluster analysis methodologies to segment PFLs based on their ownership motivations. Recent research has indicated that typologies based on attitudes and other cognitions also may be useful for understanding and improving communications with PFLs (e.g., Richter & Lewis, 2007; Van Herzele & Van Gossum, 2008).

In another chapter of this dissertation (Chapter 3), I evaluated the quality of typologies,

using the two common typology approaches (behavior-based and motivations-based) and a new typology approach based on three cognitions from a social-psychological framework, the Reasoned Action Approach (Fishbein & Ajzen, 2010). My evaluation revealed four behavior-based types, three motivations types, and four reasoned action types (Table 4.1; for more information on each of the types within the typologies and how they were created, see the Methods of this chapter). The three typology approaches grouped the PFL survey respondents in different ways; yet there was some overlap in types. According to my evaluation of these typologies (i.e., reliability through split-halves analysis, predictive validity, and comparison against quality characteristics of typologies), the reasoned action typology approach was as rigorous and effective as the behavior-based and motivations-based typology approaches. Thus, as I explain in chapter 3, any of these typologies are appropriate for segmenting PFLs to better understand their habitat management behavior although behavior-based may be easiest for practitioners to understand.

Table 4.1. Three landowner typologies (based on behavior, motivations, and reasoned action) and their component types.

Typology & Types	Characteristics	Percentage of Respondents	Number of Respondents
Behavior Types			
Non-adopter	No past experience or future intention to patch-cut[1]	39%	254
Potential adopter	No past experience but future intention to patch-cut	28%	180
Past adopter	Past experience but no future intention to patch-cut	5%	33
Continuing adopter	Past experience and future intention to patch-cut	28%	182
Motivations Types			
Preservationist	Only non-consumptive motivations	41%	259
Utilitarian	Non-consumptive and consumptive motivations (but not living off land)	26%	163
Homesteader	All motivations (non-consumptive, consumptive, and living off land)	33%	204
Reasoned Action Types			
Doer	Very positive attitude, high control (but low norms)	26%	177
Neutral	Neutral on attitudes, control, norms	22%	149
Observer	Positive attitude, moderate norm and control	30%	203
Rejecter	High control (but low norm and negative attitude)	21%	144

[1]Past behavior was measured as conducting the activity in the past ten years ("yes" or "no"). Behavioral intention was measured as likelihood to conduct the activity in the next five years ("not at all likely" vs. "slightly likely", "moderately likely", or "very likely").
[2]Three ownership motivation factors were created based on patterns of response to the survey items. These included consumptive motivations (e.g., hunting/fishing); living off the land motivations (e.g., personal use of timber products); and non-consumptive motivations (e.g., enjoy scenery).
[3]Attitude measured how "bad or good" patch-cutting was for land and for wildlife. Norm measured the perception of how common it is that other landowners in the area patch-cut. Perceived behavioral control assessed whether a respondent would to be able to conduct a patch-cut if he or she decided to do so. Characteristics of these types are based upon cluster centers for each type on the three variables.

Typology Research and Application

Landowner typology research has been touted for its potential utility to guide education and outreach (Salmon et al., 2002), extension (Hujala et al., 2010), social marketing (Broderick et al., 1996; Butler et al., 2007; Tuttle & Kelley, 1981), incentives (Bieling, 2004; Jennings & Putten, 2006), landowner assistance programs (Richter & Lewis, 2007; Ross-Davis & Broussard, 2007), and policies (Boon, Meilby, & Thorsen, 2004; Butler et al., 2007; Mizaraitë & Mizaras, 2005; Novais & Canadas, 2010; Van Herzele & Van Gossum, 2008). However, solid insights on how to actually apply this information are limited.

The most detailed information on how to apply landowner typology findings is in the realm of education, outreach, and communications. Several typology researchers suggest ways to tailor messages to resonate with the various types of landowners (e.g., Broderick et al., 1996; Salmon et al., 2002). Recommendations are also provided for the best formats and tools for different types of PFLs (e.g., Salmon et al., 2002; Tuttle & Kelley, 1981). For example, a PFL more active in land management might require advanced information through workshops, paired with practical assistance, whereas another less active PFL might require brochures to enhance his awareness and interest prior to detailed or technical information. Other researchers suggest the best communication channels for each type within a typology (e.g., Bieling, 2004; Broderick et al., 1996). Uniquely, one study developed two typologies with the same set of landowners–one based on ownership objectives to guide the content of communications and one based on PFL motives to guide the tone of communications (Hujala et al., 2010).

Guidance for how to apply landowner typology research to other types of tools lags behind the detailed suggestions of researchers for such applications in education, outreach, and communications described above. Two researchers have provided general suggestions on how to

apply typologies to a broader array of tools. Majumdar et al. (2008, p.182) recommend targeting policies to each owner type "according to their needs and interests and thus policy implementation can be made more efficient." However, they do not explain how this happens, beyond "multiple objectives owners" possibly liking several types of tools and "timber owners" having preferences for financial tools. Van Herzele & Van Gossum (2008) conducted follow-up focus groups with each of their landowner types, in order to develop subtypes, for which they recommend different tools. For example, the "economist" type included the subtypes of "traditionally oriented" (who think of the forest as an investment that must produce timber and/or firewood) and "forest workers" (who carry out the work themselves). For "traditionally oriented" landowners, the researchers suggested using monetary incentives, timber sales, and expert advice. For "forest workers", they suggested field discussion, stand-level visualization, flexible cutting regime, and all-day events. Similarly, the suggestions for tools in both studies are not based on empirical findings but instead are recommendations from the researchers' experience working with landowners, extending beyond their focus group findings.

Ross-Davis and Broussard (2007) studied differences in actual participation in forestry programs by type of landowner. They compared three types of landowners segmented in an ownership motivations-based typology. They did not find significant differences among the types on their familiarity with the programs, and they were unable to detect differences in enrollment given low respondent participation in these programs. Thus, it is unknown if various types of landowners differ in their actual participation in the programs.

Research Questions

To address (1) the theoretical gap in empirically understanding how PFL typologies relate to effectiveness of tools in changing landowner behavior and (2) the applied gap in advising

interested agencies and organizations on how to best develop tools to engage landowners in creating ESH through cutting patches of trees, I explore four research questions. The first research question considers the behavior and behavioral intentions by type, so we can better understand how many landowners in the population are currently undertaking the behavior or plan to do so in the future. The second research question addresses the influence of the tools on the management behavior of landowners. The third research question relates the behavioral influence of tools to typologies.

Research Question 1) Does past patch-cutting behavior of landowners and likelihood of future patch-cutting behavior vary by landowner typology?

Research Question 2) Which tools will increase the likelihood that landowners will cut forest patches on their lands?

Research Question 3) How does the influence of tools on patch-cutting behavior vary by landowner typology (behavior-based, motivations-based, or reasoned action-based)?

Methods

My research focused on the Southern Tier of New York State where the creation of ESH is a high priority for wildlife-habitat conservation (NYSDEC, 2006). I conducted a mail survey of a random sample of landowners with at least 10 acres of land in at least one contiguous parcel in one of the thirteen Southern Tier counties. In order to ensure an adequate number of those with large landholdings, I created a distinct sampling frame for those with 50 acres or more and for those with 50 acres or less. From each sampling frame, surveys were mailed to 1250 potential respondents (2500 total landowners). Our sample was drawn from tax code records obtained from the New York Department of Taxation and Finance Office of Real Property Tax Services, limiting our selection of participants to those with tax codes that would contain PFL's.

For more information on sampling, see Dayer et al., 2011.

Landowner Survey

Data collection. Data were collected from November 2010 to January 2011 using a mail survey instrument following a modified Tailored Design Method approach (Dillman, Smyth, & Christian, 2009). The approach consisted of four mailings: cover letter and questionnaire, reminder postcard, cover letter and replacement questionnaire to non-respondents, and reminder postcard to non-respondents. After the initial mailing, follow-up mailings were conducted at regular intervals at a maximum of two weeks apart.

In total, 1036 individuals responded to the survey (521 from the 10-49 acre strata; 514 from the 50 or more acre strata). After accounting for undeliverable mailings, the overall response rate was 43%. For the purpose of the analysis, both landowner samples were combined to ensure adequate sample size. It was not possible to weight the sample for acreage size as many respondents owned more than one parcel, and a population estimate was unavailable for total acreage size.

A telephone survey non-response check was administered by the Survey Research Institute at Cornell University to a random sample of 50 non-respondents from each stratum to identify any sources of non-response bias. The telephone survey included a subset of items (land characteristics, preferences for land characteristics, attitudes, ownership motivations, beliefs, cutting behavior, gender, age, and education) from the mail back survey to allow for comparison between respondents and non-respondents to the mail survey. T-test and chi-square tests revealed that the respondents and non-respondents differed significantly on two land characteristics, several motivations, behavioral intentions, and education level (Appendix A). However, the effect size of all of these differences were minimal (Vaske, 2008), so the respondent sample was

not weighted.

Survey items. The survey instrument examined past behavior of landowners and behavioral intentions to create a patch-cut, defined as: "cutting a patch of trees [at least a ½ acre] where all or most of the trees are removed [to open the canopy] and then plants and trees allowed to grow back." Past behavior was measured as conducting the activity in the past ten years ("yes" or "no"). Behavioral intention was measured as likelihood to conduct the activity in the next five years ("not at all likely", "slightly likely", "moderately likely", or "very likely").

The survey instrument also measured ownership motivations by asking how important each "reason you own your land" was to respondents, on a five-point scale from "not at all important" to "very important." Attitude was assessed with two five-point Likert scale items (e.g., "very bad" to "very good"). Respondents assessed whether the behavior was "bad or good" for their land and for wildlife. One item assessed perceived norm by asking respondents "how common it is that other landowners in your areas do this activity [cutting a patch of trees (at least ½ acre)]." Respondents answered on a four-point scale from "not at all common" to "very common." Perceived behavioral control was assessed by one four-point scale item "to what extent do you feel you are able to get the following activity [cutting a patch of trees (at least ½ acre)] done on your land (if you decide to do so)?" to which they could respond from "not at all able" to "very able".

The likelihood of behavioral influence of tools was measured with an item that asked "to what extent would any of the following conditions increase your willingness to cut more patches of trees (at least ½ acre)?" Survey respondents were asked to rate their increase in willingness (not increase, slightly increase, moderately increase, and greatly increase) for each tool (e.g., "received financial assistance or tax reduction"; for complete list see Table 3). These options

were informed by a qualitative phase of research, including landowner and expert interviews (see Dayer et al, 2011).

Analysis

Analyses were conducted with SPSS 19.0. All respondents who selected "don't know" on the norm item were removed from the analyses, as well as any respondents who did not answer this item, the attitude, the perceived behavioral control, and/or behavioral intention items. The resulting sample included 673 respondents.

Landowner typologies. The three landowner typologies created in Chapter 3 were used in these analyses (Table 1). The behavior-based typology included four types based upon their past and future adoption of patch-cutting: Non-adopter, Potential adopter, Past adopter, and Continuing adopter.

The motivations typology utilized a common method for segmentation in the landowner typology research (Finley & Kittredge, 2006): 1) data reduction using principal components analysis (with varimax rotation) to create factors where necessary (i.e., motivations) and 2) segment formation using cluster analysis. For the cluster analysis, I conducted a hierarchical analysis (Ward's method) to determine the number of clusters from the dendogram and then conducted a k-means cluster analysis (Butler et al., 2007). The motivations typology included three types determined by a cluster analysis of three land ownership motivation scales: "Preservationist" (41%), "Utilitarian" (26%), and "Homesteader" (33%). Non-consumptive motivations were important to all types. The primary distinction between the latter two types was whether they found "living off the land" motivations important, as well as consumptive motivations (Homesteader).

For the reasoned action typology, I formed segments using cluster analysis using the

same method as with the motivations typology, but using variables from the Reasoned Action ApproachFishbein & Ajzen, 2010). The reasoned-action typology included four types determined by a cluster analysis of the attitude, norm, and perceived behavioral control item: "Doer" (26%); "Neutral" (22%); "Observer" (30%); and "Rejecter" (21%). The "Doer" type included individuals who have a positive attitude toward cutting patches and high perceived behavioral control about their ability to cut patches. The individuals in the "Neutral" type expressed neutral or low attitudes, norms, and perceived behavioral control. Similarly, the "Observer" type members held the highest norm of the types and were slightly positive or moderate on the other cognitions. The "Rejecter" type included those who have a negative attitude toward cutting patches but high perceived behavioral control.

Patch-cutting behavior and typologies. To assess how the types differed on past and future patch-cutting behavior, I conducted Chi-square analyses. For each of the typology approaches, two sets of analyses were conducted. In both analyses, the typology was the independent variable and past patch-cutting (analysis one) or future patch-cutting intention (analysis two) was the dependent variable.

Tools' behavioral influence. First, the eleven tools were reduced into three scales, using principle components analysis with varimax rotation. Cronbach's alpha was used to assess scale reliability before creating mean summative scales for each factor. Then I assessed the mean increase in willingness to patch-cut for each of the tools of action scales.

Tools and typologies. To assess the mean behavioral influence for each of the tools scale by typology, as well as which the influence of each tool by type within the typology, I conducted Repeated Measures ANOVAs. For each of the three typologies (independent variables), I conducted a single RMANOVA (with each of the tools scales as the dependent variables). For

the F-value, I measured the Pillai's Trace multivariate test of significance. To determine how types within a given typology differed from each other and across tools in the behavioral influence of tools, I conducted Scheffe post-hoc analyses.

Results

Patch-Cutting Behavior

Within each of the three typologies (behavior, motivation, and reasoned action), there were significant differences among the types of landowners in terms of their past patch-cutting behavior and future likelihood of patch-cutting (Table 4.2). Those differences were most pronounced for the behavior typology, owing at least in part to the behavior variables being used to define the typology. Continuing adopters expressed a greater likelihood of patch-cutting in the future (40% "very likely") than the other three types in the behavior typology, as well as any type in the other cognition and motivation typologies.

Significant past and future behavioral differences among types were also present within the motivations-based and reasoned action typologies (Table 4.2). For the motivations typology, only one difference between types was found: fewer Preservationists had conducted patch-cuts in the past (23% of the individuals in the type compared to 40% of Utilitarians and Homesteaders) and expressed less future likelihood to patch-cut than the other types (54% "not at all likely" compared to 34% of Utilitarians and 41% of Homesteaders). Otherwise, the responses for Utilitarian and Homesteader types were similar. For the reasoned action typology, the Doer and Observer types had more past experience than the other types (48% and 52% respectively, compared to 10% of Rejecters and 12% of Neutrals) and more intent to conduct the behavior in the future (23% and 19% "very likely," compared to 2% of Rejecters and 0% of Neutrals).

Table 4.2. Prevalence (%) of past patch-cutting behavior and future patch-cutting behavioral intention by behavior, motivations, and reasoned action typologies.

	Behavior Types				
	Non-adopter	Potential adopter	Past adopter	Continu-ing adopter	Pearson Chi-square
Past Patch-cut Behavior	0	0	100	100	649.00***
Future Patch-cut Behavior (not at all likely)	100	0	100	0	729.29***
Future Patch-cut Behavior (slightly likely)	0	72	0	30	
Future Patch-cut Behavior (moderately likely)	0	23	0	31	
Future Patch-cut Behavior (very likely)	0	6	0	40	
	Motivations Types				
	Preserv-ationist	Utilitari-an	Home-steader		Pearson Chi-square
Past Patch-cut Behavior	23	40	40		19.10***
Future Patch-cut Behavior (not at all likely)	54	34	41		27.10***
Future Patch-cut Behavior (slightly likely)	27	29	28		
Future Patch-cut Behavior (moderately likely)	12	19	16		
Future Patch-cut Behavior (very likely)	7	18	16		
	Reasoned Action Types				
	Doer	Neutral	Observer	Rejecter	Pearson Chi-square
Past Patch-cut Behavior	48	12	52	10	107.85***
Future Patch-cut Behavior (not at all likely)	25	64	28	74	165.66***
Future Patch-cut Behavior (slightly likely)	27	31	32	20	
Future Patch-cut Behavior (moderately likely)	24	5	22	4	
Future Patch-cut Behavior (very likely)	23	0	19	2	

Note: ***p<.001; percentages that do not add to 100% are due to rounding.

Tools' Behavioral Influence

I first created three tools scales based upon the results of the factor analysis (Table 4.3). The factors included basic needs tools (48.32% of the variance explained; 4 items), learning tools (10.24 %; 4 items), and social tools (9.24%; 3 items). The Cronbach's alpha indicated acceptable reliability for all scales (Table 4.4): basic needs tools (0.82), learning tools (0.89), and social tools (0.76).

Overall, learning tools were most likely to influence landowners' patch-cutting behavioral intention (M = 2.42), followed by basic needs tools (M = 2.12) and social tools (M = 1.50). Across all tools the averages were low – just above "slightly likely to influence=2" to "not at all likely to influence=1".

Table 4.3. Factor loadings, eigenvalues, and % of variance explained for factors of the11-item tools of action survey question using principal components analysis.

Tool of action	Factor 1 Basic Needs	Factor 2 Learning	Factor 3 Social
Received financial/tax assistance	.800	.111	.172
Found market for cut wood	.794	.138	.161
Received advice from expert	.551	.641	.194
Had plan for land that called for it	.544	.613	.159
Borrowed free equipment	.617	.297	.335
Received labor to conduct activity	.709	.300	.228
Learned activity benefits wildlife	.201	.874	.248
Learned activity benefits rare wildlife	.146	.887	.237
Found more people doing it in the area	.293	.286	.683
Found fewer people doing it in the area	.232	.112	.787
Received recognition from state agency/nonprofit	.232	.133	.720
Eigenvalues	5.798	1.228	1.108
% of variance explained	48.320	10.235	9.237

Table 4.4. Scale reliability, corrected item-total correlation, and alpha if item deleted for items in three tools of public action scales (basic need, learning, and social).

Tools of Action Scales	Corrected item-total correlation	Alpha if item deleted	Cron-bach's Alpha
Basic Needs Tools Scale (M =2.12)			.823
Received financial/tax assistance	.651	.776	
Found market for cut wood	.616	.792	
Borrowed free equipment	.636	.783	
Received labor to conduct activity	.688	.759	
Learning Tools Scale (M = 2.42)			.891
Received advice from expert	.764	.858	
Had plan for land that called for it	.719	.874	
Learned activity benefits wildlife	.793	.846	
Learned activity benefits rare wildlife	.762	.858	
Social Tools Scale (M = 1.50)			.764
Found more people doing it in the area	.621	.656	
Found fewer people doing it in the area	.651	.629	
Received recognition from state agency/nonprofit	.526	.726	

M denotes the mean for the scale. Items were measured on a 4-point scale where1 = not increase, 2 = slightly increase, 3 = moderately increase, and 4 = greatly increase.

Typologies and Tools

Within each of the typologies, one or two types consistently reported greater influence on their behavioral intentions from the tools (Table 4.5). For the behavior-based types, Potential adopters and Continuing adopters reported higher likelihood to change their behavior with each of the tools than did Non-adopters. For motivations types, Utilitarians' intentions were most affected by the tools. For the reasoned action types, the Doer and Observer types reported strongest influence from the tools; the Rejecter type was least influenced. Also, across all typologies, each type reported the highest mean influence from learning tools and lowest influence from social tools. Continuing adopters were the only type that reported that they would be influenced by basic needs tools at the same level as learning tools.

Table 4.5. Means, Repeated Measures ANOVA, and Scheffe post-hoc analyses for tools of action scales by behavior, motivations, and reasoned action typologies.

	Behavior Types							
	Non-adopter *M*	Potential adopter *M*	Past adopter *M*	Continuing adopter *M*	F (Tools)	Partial Eta^2	F (Tools by Type)	Partial Eta^2
Basic Needs Tools	1.82$^{a, A}$	2.29$^{b, A}$	1.79$^{a, A}$	2.52$^{b, A}$	204.30***	.41	5.30***	.03
Learning Tools	2.20$^{a, B}$	2.63$^{b, B}$	2.23$^{a,b, B}$	2.58$^{b, A}$				
Social Tools	1.35$^{a, C}$	1.66$^{b, C}$	1.36$^{a,b, C}$	1.72$^{b, B}$				
	Motivations Types							
	Preservation-ist *M*	Utilitarian *M*	Homesteader *M*		F (Tools)	Partial Eta^2	F (Tools by Type)	Partial Eta^2
Basic Needs Tools	1.94$^{a, A}$	2.50$^{b, A}$	2.17$^{c, A}$		349.58***	.55	4.19**	.01
Learning Tools	2.34$^{a, B}$	2.68$^{b, B}$	2.36$^{a, B}$					
Social Tools	1.40$^{a, C}$	1.72$^{b, C}$	1.58$^{b, C}$					
	Reasoned Action Types							
	Doer *M*	Neutral *M*	Observer *M*	Rejecter *M*	F (Tools)	Partial Eta^2	F (Tools by Type)	Partial Eta^2
Basic Needs Tools	2.52$^{a, A}$	2.05$^{b, A}$	2.24 $^{a, A}$	1.69$^{c, A}$	367.28***	.55	5.64***	.03
Learning Tools	2.65$^{a, B}$	2.31$^{b,c, B}$	2.58$^{a,b, B}$	2.09$^{c, B}$				
Social Tools	1.64$^{a, C}$	1.54$^{a, C}$	1.68$^{a, C}$	1.26$^{b, C}$				

Notes: * p<.05 ** p<.01 ***p<.00; superscript letters a, b, c denote statistically significant means for the rows according to Scheffe post-hoc analyses; superscript letters A, B, C denote statistically significant means for the columns according to Scheffe post-hoc analyses. Tools are mean composite scales, composed of variables where 1 = not increase; 2 = slightly increase; 3 = moderately increase; 4 = greatly increase.

Discussion

My research suggests that landowner types most likely to be influenced by tools include the highest percentages of individuals who conducted the behavior in the past as well as those that expressed a willingness to engage in the behavior in the future, even if they have not yet done so. Thus, these tools—taken as a whole—may not reach new audiences, but instead primarily reinforce the behaviors of those already undertaking them and/or those who have some existing propensity to do so. Similarly, Serbruyns and Luyssaert (2006) found that PFLs accept tools if they do not require them to make a change in their current management practices.

Across all tools, Non-adopters and Past adopters in the behavior-based typology, Preservationists in the motivations typology, and Rejecters in the reasoned typology were at most only "slightly likely" to change behavior. Past landowner typology research has also found that some types may be reticent to undertake recommended management practices regardless of which tools are used. This finding was consistent across both behavior-based (Broderick et al., 1996; Tuttle & Kelley, 1981) and motivations typologies (Butler et al., 2007; Ross-Davis & Broussard, 2007; Salmon et al., 2002; Van Herzele & Van Gossum, 2008). Some researchers have recommended ignoring or deprioritizing certain types of landowners for whom efforts are unlikely to succeed or would require too much effort (e.g., Butler et al., 2007; Salmon et al., 2002; Tuttle & Kelley, 1981). Other researchers call for focused effort on these challenging-to-engage types (Broderick et al., 1996), trying innovative methods rather than simply providing information (e.g., a forest real estate market for management behaviors; Van Herzele & Van Gossum, 2008), or conducting intensive qualitative research to understand them better (Bieling, 2004). In my study, neither ignoring less interested landowners nor focusing on unique solutions appears to be necessary given one tool still stood out as most likely to influence all types.

Across all landowner types, learning tools tended to be most appealing, followed by basic needs tools, and social tools tended to be the least appealing. Only Continuing adopters found basic needs tools to be as appealing as learning tools. These results run counter to past landowner typology research, which assumed that a wide variety of landowners would respond differently to a variety of tools (i.e., Jennings & Putten, 2006; Majumdar et al, 2008). Thus, my study indicates "one size may fit all." Even the types of landowners less interested in tools overall are at least slightly interested in learning. These less-interested landowners may become more interested in other tools (e.g., basic needs) following application of learning tools, which may explain why Continuing adopters, who have experience with the behavior, are interested in basic needs tools. Serbruyns and Luyssaert (2006) found that landowners who are more informed and educated will be more accepting of other tools. Such a progression is not unlike that suggested by Salmon et al. (2002), whereby a less knowledgeable landowner type may progress from receiving information in a brochure to seeking out assistance from a forester.

Those who create tools should keep in mind that simply making tools available will likely not be enough. Although in this research the survey respondent is hypothetically being offered these tools, in actuality, the availability of tools tend to be largely unknown by PFLs (Ross-Davis & Broussard, 2007), and many landowners may not be motivated enough to search out programs employing these tools. Outreach is essential for ensuring landowners hear about the availability of tools. Attention will also need to be given to the specifics of program design using these tools. For example, which agency or organization implements the tool can lead to differing interest among landowners (Cubbage, Harou, & Sills, 2007). Thus, it is often more effective to implement tools through collaboration of a variety of agencies and organizations (Jones et al., 2012; Salamon, 2002; Van Gossum et al., 2012).

Conclusion & Future Research

This paper addressed the assumption that different types of landowners might be influenced to take action by different tools. Counter to typical recommendations that different types of landowners need to be engaged in different ways, I found that nearly all landowner types would be most influenced by learning tools. Practically, this emphasis on learning tools suggests programming that connects landowners with experts who can offer advice as well as provide plans with recommendations on where such patch-cutting should occur. Additionally, landowners indicated they would be responsive to messaging that patch-cutting benefits wildlife, or, where appropriate, rare wildlife.

Whereas consistent preference for learning tools may suggest a clear direction in which tool to use, this preference across nearly all types raises additional questions. First, this emphasis on learning tools counters past literature, which often emphasizes financial-policy tools (Kilgore et al., 2007). Second, it causes us to ask: *Should we abandon altogether the idea of targeting strategies to different types of landowners?* I suggest not. These inconsistencies with past literature may be due to somewhat unique attributes of patch-cutting behavior. It is cost- and time-intensive to perform and may be less in line with commonly held public perceptions (i.e., that cutting trees, particularly even-managed management, can be bad for wildlife [Gobster, 2001]). Thus, patch-cutting behavior change may more universally necessitate knowledge, advice, and education before the challenging and controversial task will be considered. Continuing adopters, the only type with all of the members of the type having experience in patch-cutting, was also the only type that found basic needs tools as likely to change their behavior as learning tools. Their uniquely similar level of influence from basic needs tools and learning tools may be because they already believe there are some benefits to the behavior so

they will act as a result of other tools. Also, having conducted the behavior, they may now have more awareness that basic needs tools would be helpful to them. Rather than abandoning typology research, I suggest that there may be a class of more intensive and less common behaviors that may not require different approaches by types or may require a phased approach lf learning tools followed by basic needs tools. Certainly, this hypothesis warrants future research to explore whether preferences for tools vary by types of landowners with some behaviors but not others.

Additionally, I recommend future research be undertaken to explore whether predicted behavior changes are in line with actual changes upon implementing tools. Research on the effectiveness of implementation of typology research and tools for PFLs (Kilgore & Blinn, 2004) are both lacking. There would be value in exploring whether a given tool is more likely to actually change behavior (in contrast to the behavioral intention measures I employed in this work) and whether these effects vary by type of landowner. It would also be useful to determine whether those types that reported more or less likelihood to change behavior with a tool do so in actuality. Opportunities for such research are plentiful with many conservation organizations, agencies, and initiatives beginning to implement programs to encourage landowners to manage for ESH.

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CHAPTER FIVE: CONCLUSION

Engaging private landowners in habitat conservation is needed to meet the goals of landscape-level wildlife conservation. This dissertation provides insights into how conservation initiatives, agencies, and organizations, that typically focus on the biological components of conservation planning and implementation, can better understand landowner behavior, identify how landowners vary, and develop tools to better engage landowners with an interest in conservation activities on their land. Better incorporating the human dimensions of private lands conservation will be critical as conservation efforts seek to protect existing habitat on private lands, implement management activities to improve habitat quality and quantity, as well as conserve the species that people value.

Summary of Findings

Engaging private landowners is especially important for management of early successional forest habitat (areas with persistent shrubs or seedling-sized to sapling-sized trees that are typically a response to disturbance) in the Northeastern United States. Conservation plans resulting from ESH-related initiatives recommend forest management on private lands to create sufficient ESH to sustain wildlife populations. These plans often specifically reference the need for landowners to conduct even-aged management practices (e.g., clear-cut or group selection) in their forests as the best way to create ESH conditions. Compromised of three research articles, this dissertation examined private landowners' behavioral intentions to cut patches of forest, which could, through regeneration, provide early successional habitat (ESH). The articles were based upon data and results from a landowner mail survey that was administered in the Southern Tier of New York State in 2010-2011.

In this first research article (Chapter Two), I applied the Reasoned Action Approach from

social psychology to understand the intentions of landowners to conduct patch-cuts, a type of even-aged management. I explored the role of the direct determinants of intention to cut patches (attitudes, norms, and perceived behavioral control), as well as associated beliefs. To the social psychological model, I added land characteristics (amount of land, amount of mature forest, and amount of ESH) and landowner characteristics (membership in a game wildlife organization, residence on land, and past behavior). Congruent with past landowner research, attitude was the strongest predictor of behavioral intention, and beliefs contributed indirectly to behavioral intention through the direct determinants described above. Landowner characteristics predicted beliefs better than land characteristics, and membership in an organization that focuses on conservation of hunted wildlife species was a particularly powerful predictor. Unlike the other land and landowner characteristics, past behavior directly influenced the behavioral intention and the direct determinants. My results show that landowners are more likely to conduct patch-cuts if they think the behavior benefits their land and wildlife, believe land and wildlife management are beneficial, have cut patches of trees on their land in the past, and belong to a game wildlife organization. Strategies to engage landowners in ESH conservation will have the greatest likelihood of success if they focus on influencing behavioral beliefs and subsequently attitudes, possibly working with game wildlife organizations.

In the second research article (Chapter Three), I developed and compared the performance of typologies based on the commonly used variables in landowner typology research (landowner behaviors or landowner ownership motivations) and a new set of variables—cognitions from the Reasoned Action Approach described above (i.e., attitudes, norms, and perceived behavioral control). To evaluate how this reasoned action typology compared to the well-established typology approaches, I employed three methods of assessment:

reliability through split-halves, predictive validity through external variables, and application of criteria that characterize quality typologies. According to the assessment, the typology based on reasoned action cognitions performed no better or worse than the more common typologies. The behavior-based typology appeared to be most useful for practitioners to inform their education, outreach, and communications efforts.

The third research article (Chapter Four) focused on using the landowner typologies (created and described in Chapter Three) to inform the selection of tools of public action for ESH management. This paper addressed the assumption that different types of landowners might be influenced to take action by different tools. Three tools of public action scales were created: basic needs (e.g., financial assistance), learning (e.g., education about wildlife benefits), and social support (e.g., timber management becomes more common). I found that across all landowner types and typologies, learning tools were most likely to influence landowner intentions to conduct patch-cuts, while social tools were the least likely. Only one type (Continuing adopters) reported that they would be similarly influenced by learning tools and basic needs tools. Still, on average, landowners reported that the learning tool would only "slightly" to "moderately" increase their willingness to cut more patches of trees. Additionally, in each typology, types of landowners most likely to participate in the ESH management behavior in the future were also consistently more likely to be influenced by all of the tools of public action. Thus, it appears that these tools may be reinforcing behaviors of those already undertaking them, rather than reaching new audiences. Based on the results, I suggest that learning tools be prioritized by agencies and organizations interested in engaging landowners in ESH management.

Contributions to Research: Theory & Methods

My research offers the first application of the Reasoned Action Approach (RAA; Fishbein & Ajzen, 2010) to landowner research. The Bayesian Structural Equation Modeling method provided advantages over past landowner research, allowing for comparisons of competing models and simultaneously exploring the effects of variables at different levels on the dependent variable – behavioral intention. My results highlight the importance of including beliefs and background factors, in addition to the direct determinants of behavioral intention, to ensure full understanding of why landowners do or do not conduct a behavior. While I extended the RAA further to consider the ecological, as well as individual and social characteristics that have the potential to influence individual decision-making, the land characteristics proved to not provide much additional explanation.

The relevance of my findings also extends beyond landowner research applications to RAA research more broadly, demonstrating the value of theorizing the role of the background factors. Most importantly, I found that some background factors only influence behavioral intention indirectly through beliefs, but that others have an impact on direct determinants and even, in the case of past behavior, the behavioral intention itself.

To the field of typology research, I contributed the first application of comprehensive quantitative and qualitative methods to compare landowner typologies. Within one sample of landowners I found three typologies that are nearly equivalent in their assessment results overall, though different in the specific results (i.e., particular landowner classifications) they return. Most importantly, my research showed that the typologies are not interchangeable given different strengths for application: one typology stood out as the most predictive of landowners interested in receiving more information and another stood out as most recognizable by

practitioners. Assessments, such as the one presented in this dissertation, can provide a more complete understanding of the strengths and weaknesses of different kinds of landowner typologies, which researchers should report as part of their findings. Beyond landowner typology research, my dissertation demonstrated how to apply qualitative criteria for comparing the representativeness and rigor of typologies (e.g., Rich, 1992). Additionally, I recommended adaptations to these criteria when applying them to cluster analysis-derived typologies, including relaxing the criteria related to theory driving distinctions between types.

Lastly, I offered the first empirical comparison of the effectiveness of various tools of public action for engaging diverse landowner types in forest management behavior. Counter to typical recommendations that different types of landowners need to be engaged in different ways, I found that all landowner types would be most influenced by learning tools. This finding that landowners prefer learning tools conflicts with past landowner research that emphasizes financial tools (Kilgore et al., 2007). These uncommon findings are possibly due to unique characteristics of the behavior of patch-cutting—an intensive forest management strategy, which, unlike thinning, is even more time and cost intensive and associated with negative preconceived connotations among the public. Thus, behavior change related to patch-cutting may more universally necessitate knowledge, advice, and education before the challenging and controversial task will be considered. Following this learning, additional tools may then be necessary for different types.

Contributions to Conservation: Policy & Practice

This dissertation suggests that education, outreach, and communications (EOC) to engage landowners in even-aged forest management for ESH conservation should focus on behavioral beliefs and attitudes related to managing forests and wildlife and the positive outcomes of even-

aged management for wildlife and land. Counter to the assumed need to create different tools to engage different types of landowners, my research indicates that EOC is currently the best approach for all types of landowners, but will likely be more successful with types of landowners more interested in participation and unsuccessful with non-adopters. My research also indicates that basic needs tools may be needed in the future when more landowners become experienced with the behavior.

The results of this work have already begun to guide state fish and wildlife agencies, NGOs, and conservation initiatives interested in supporting landowners in managing for ESH and ESH-reliant species on their land. The New York State Department of Environmental Conservation Bureau of Wildlife managers have met on several occasions to discuss results and how to apply them. As a result of these conversations, the Bureau Management Team adopted a charge for the Land Management Habitat Conservation Team: "Initiate the development of a strategic plan for habitat management on state lands and private lands, including a focus on early successional habitats (includes liaison with other Teams, and with the Division of Lands and Forests)." Additionally, the Bureau of Wildlife has funded two additional seasonal forestry technicians within the Division of Lands and Forests to assist with forestry work on Wildlife Management Areas to allow them greater ability to conduct timber management to benefit ESH species on their own lands. The Bureau of Wildlife managers are also working one-on-one with regional forestry staff that work with private landowners, using recommendations of my research, to encourage them to promote cutting prescriptions for ESH. Additionally, Audubon New York has followed up on recommendations and hosted workshops with landowners in New York State, along with partner organizations, to increase landowner awareness of the need for ESH and incentive programs available for their management activities. The New England

Cottontail Recovery Team also incorporated results from this research in their northeast-wide Communications Plan (www.newenglandcottontail.org), guiding their recommendations for landowner communication tools and messaging. Similarly, the Young Forests Initiative of the Northeast Association of Fish and Wildlife Agencies incorporated results of my research into their new guide for communicating about ESH (Oehler et al., 2013).

Game wildlife NGO-led initiatives (i.e., Woodcock Initiative) are beginning to partner with nongame wildlife NGO-led initiatives (i.e., Golden-winged Warbler Working Group), which this research suggests will be beneficial. Additionally, the National Wild Turkey Federation is now administering the Working Lands for Wildlife initiative for Golden-winged Warblers (a private lands initiative from Natural Resource Conservation Service and U.S. Fish and Wildlife Service). Yet, there is even more potential for these initiatives, agencies, and organizations to work together given the constraints they all face of limited resources and capacity. In March 2011 the study team for my research hosted a workshop to bring together all of the stakeholders in New York State to discuss how to work together on private lands ESH conservation. While the workshop did result in increased interest in collaboration and a working group in the St. Lawrence Valley, there is continued need for such collaborative efforts throughout the state on private lands ESH conservation. The first meeting of New York State partners interested in Golden-winged Warbler conservation was held in March 2013, suggesting more coordination in the state may be forthcoming for at least this ESH species.

Impacts on ESH-reliant Species

Engaging private landowners can produce population-level impacts on declining wildlife species (Bogart, Duberstein, & Slobe, 2009). Here, I present the results of my estimate of the extent to which EOC, following the guidance from my research, might have a bird population-

level impact if applied at a landscape scale. I focus on birds given that clear guidance is available on the amount of habitat needed for birds. I adapt an approach used by Playa Lakes Joint Venture to link biological planning data with landowner survey findings to estimate whether landowner EOC could aid them in reaching habitat and population goals (Bogart et al., 2009). By multiplying the percent of landowners likely to take on the conservation activity by the number of playas by average playa size, they determined the number of acres EOC efforts might impact. They then estimated the number of individuals for species of concern (e.g. Cassin's Sparrows) likely to respond per acre treated, finding a potential 15% increase in the species' population.

I conducted a similar rough calculation of the potential geographic impacts of my research results on declining ESH bird species. The 13 Southern Tier counties where we conducted our research encompass 11,056 square miles (approximately 7.1 million acres), and 4.6 million of these acres are forested (Miles, 2013). To calculate the amount of forested land owned by the private forest landowners (PFLs) that this study focused on, I multiplied the forest land by 60% (estimated from New York State family forest owner percentages reported by Butler, 2008), finding that roughly 2.8 million acres of forestland in the Southern Tier may be owned by PFLs. I adjusted this amount for the percentage of landowners with over ten acres (estimate from New York State percentages reported by Butler, 2008), which was the minimal amount of land for our study population, resulting in an estimated 2.5 million acres of forest land owned by our study population.

I then applied my landowner survey data to determine the extent of land that might be patch-cut based on behavioral intentions. According to my results, the average PFL owns 124 acres in the Southern Tier, resulting in a population of 19,860 PFLs owning the estimated 2.5 million acres of parcels over 10 acres, which I suspect to be an underestimate of the landowner

population size given my sampling method of assuring large landowner representation. Combining this conservative estimate of number of PFLs and my survey result that 53% of these landowners reported at least a "slight" intention of cutting a patch of at least a half-acre in the next five years, I estimate that 10,526 properties covering 5,263 acres could receive patch-cuts. If the patch-cuts were five acres in size on average instead (given that we asked landowners about the minimum size they would cut), then 52,629 acres could be treated with patch-cuts in the next five years. Or, if I conducted the same estimate with the only 25% of landowners that reported they were "moderately" or "greatly" likely to conduct patch-cuts, it would result in 2,482 acres treated with ½ acre patch-cuts or 24,825 acres treated with 5 acre patch-cuts. Thus, there is a large range in potential area impacted, and the upper bound is unknown given that the survey only asked about the minimum acreage of ½ acre patch-cut. These habitat estimates can be combined with estimates of populations and densities per acre to derive numerical conservation targets and to determine what proportion of regional population objectives can be met through private lands ESH initiatives.

This higher estimate for the amount of land potentially impacted is 2% of the forestland owned by PFLs (or 1% of the total forest land) in the Southern Tier that might be converted to ESH in the next five years via patch-cuts. It could also be created through other means, such as leaving fallow fields to undergo natural succession, which the survey did not address. Given that the oft-cited goal for the percentage of forestland in ESH to sustain bird populations reliant on ESH is 10-15% (Dettmers, 2003) and that ESH lasts on the landscape for only 40 years (although the window of ESH for some species is less), an appropriate target might be 1.3-1.9% of the landscape converted to ESH every 5 years. If the current amount of ESH on private lands in the Southern Tier currently fell between 10-15%, then the 2% change I estimated through patch-cuts

might be an adequate contribution from this group of landowners – assuming other types of landowners (e.g., industrial and public lands) also contribute their share. It has been estimated that the amount of private lands in my study area (13 counties of the Southern Tier) that is in seedling-sapling stage is 12.0% (Miles, 2013), which falls between the 10-15% target. However, Schlossberg & King (2009) suggest that this estimate overinflates the amount of suitable ESH for forest birds by a factor of two, so the amount on private lands might be closer to 6%. Thus, the amount PFLs may contribute in the future would not allow for reaching the target percentage, although gains could be made depending on the rate at which the current ESH on private lands is lost to natural succession or development and parcelization. Further, the 1% ESH of the total forest in the state that would come from PFLs would not be sufficient for sustaining adequate ESH, without paired efforts from industrial and public forest landowners.

Again, it should be noted that I make many assumptions with these calculations that would be best to verify. For example, what percentage of patch-cuts actually regenerate effectively to ESH? What percentage of the forested land is appropriate for patch-cutting? What is the average patch size that landowners do tend to harvest (we only asked about at least a ½ acre)? What percentage of landowners indicating likelihood to cut a patch in the next five years might actually take that action and under what conditions? What is the current percentage of ESH in the Southern Tier, resulting in what percentage that needs to be treated every five years? What percentage of the land in the Southern Tier experiences natural disturbance each year resulting in ESH? In addition to these questions, the above calculations do not account for the spatial distribution of patch-cuts and ensuring they are in the appropriate locations where ESH will most be benefit ESH-reliant wildlife species. Also, implementation of efforts to support these landowners with at least a slight intention in taking action must occur at the scale to reach

enough landowners (thousands).

Still, the results do indicate there is potential for a coordinated effort to engage landowners to make strides for population-level bird conservation outcomes if action is also taken with industrial and public landowners as well. It should be noted that all types of PFLs reported a slight to moderate increase in likelihood to conduct patch-cuts as a result of learning tools, indicating there would be strong utility in EOC efforts. This work of supporting landowners will have to be done in coordination as no one agency or organization has adequate capacity. Yet, the effort seems justified given that a significant amount of land could be impacted if landowners with intentions to act actually act and if their patch-cuts are larger in size than the minimum in my survey.

Contributions to Conservation: Bridging the Implementation Gap

As identified in the conservation field, there is an "implementation gap" in ESH conservation—while there is well-tested ecological science knowledge, prioritization, and management recommendations, conservation is not enacted accordingly (Knight, Cowling, & Campbell, 2006). A key issue causing the implementation gap is often described as a lack of interdisciplinary collaboration—particularly the integration of social sciences (e.g., Sunderland, Sunderland-Groves, Shanley, & Campbell, 2009). Given that conservation practitioners tend to face management in human-dominated landscapes, there is a need for more social science engagement to allow conservation science to be more effective (Sunderland et al., 2009). Further, social science makes the link to effective education and communications approaches with theoretical understandings and research findings underlying them (Shanley & López, 2009). Additionally problematic, scientists are removed from implementation, limiting the extent of the application of their research (Knight et al., 2008; Shanley & López, 2009; Sunderland et al.,

2009).

My research approach was aimed at addressing the ESH implementation gap, by bringing social science that addresses a practical conservation problem, engaging partner organizations, offering guidance for how to increase landowner engagement in ESH management that is informed by biological and social sciences and stakeholders, and working with practitioners to design and pilot test programs to aid landowners interested in managing habitat for ESH species. This approach follows common suggestions in the conservation literature for how to address implementation gaps, and can serve as a model for other habitat conservation challenges.

Points of Tension

This human dimensions research focuses on a management priority that is not universally accepted. Despite the ecological justification for ESH conservation efforts articulated in the previous chapters, the motivations for ESH research and management are often questioned: *Are you really just interested in increasing hunting opportunities for key game species? Are you trying to justify clearcutting that would otherwise not be supported?* While it may be true that some managers and decision-makers are motivated to champion ESH for these more narrow purposes, others appear to have much broader interests in non-game, as well as game, species and true concern for wildlife population declines. Still, criticisms are waged against ESH conservation efforts for the trade-offs with other habitat types, the lack of clarity on how much and where ESH is needed, whether people should continuously manipulate a landscape to maintain a habitat, and the role of public lands as opposed to private lands in ESH conservation. Whether these criticisms are valid is not the emphasis of this research, which focused instead on how to engage landowners in ESH conservation as prescribed by existing conservation plans; yet, I would be remiss if I did not highlight that these points of tension exist.

Habitat Trade-offs or Compatibility

Managing for ESH and associated wildlife requires trade-offs, particularly with maintaining large blocks of mature forest habitat for area-sensitive, forest-interior wildlife species. While ESH-reliant species are among the most steeply declining wildlife species in the Northeast U.S., some mature forest species also have experienced steep declines and are of high regional conservation concern (Robertson & Rosenberg, 2003). Some argue that most ESH species were at artificially high populations following clearing of Eastern forests and are now returning to historic levels; that most ESH species have large ranges and populations and are not as globally threatened as many mature forest species; and that ESH species are adapted to ephemeral and "marginal" habitats that are constantly being created (both naturally and intentionally), whereas mature forest species suffer longer-term effects when mature forests are lost or fragmented. Others argue that ESH-reliant species are of more immediate concern for conservation than mature forest species due to the steep declines and conservation priority status of several ESH species (e.g., Golden-winged Warbler that is under review for listing under the Endangered Species Act) and need for specific types of ESH. Further, openings from timber harvest to promote ESH for ESH-reliant species may not actually be detrimental to forest interior species. Given that the openings are short-lived, they do not necessarily increase access to the forest interior for predators; forest-interior birds often recolonize a cut area after 10 years; and cuts create edges inside the forest, rather than on the boundary, so the connection to agricultural and suburban areas with predators and cowbirds would not be fostered (Askins, 2000). Additionally, not only do some mature forest species use ESH during breeding, they may rely more heavily on ESH during post-breeding dispersal (after breeding and before they migrate) (Vega Rivera, McShea, & Rappole, 2003). Further research has confirmed that mature forest

birds constitute a substantial proportion of the birds using ESH in regenerating even-aged cuts during the post-breeding dispersal period (Streby, 2010). Thus, bird conservation for these two suites of species can be complementary on the same landscape (Hamel & Rosenberg, 2007). Given this necessary balance, I suggest providing the message to landowners that a matrix of age classes of forest is essential for wildlife conservation, rather than focusing solely on management for ESH.

How Much ESH and Where

While this dissertation has cited an often-used ESH target amount of 10-15% from Dettmers (2003), the target amounts vary by conservation plan. For example, the American Woodcock Conservation Plan (Kelley & Williamson, 2008) calls for 122,180 acres to be treated annually in New York State to stabilize woodcock populations. In the Ruffed Grouse Plan (Dessecker, Norman, & Williamson, 2006), the goal is greater, at 208,000 acres treated annually. Other plans, such as the New York State Department of Environmental Conservation's Comprehensive Wildlife Conservation Strategy (NYSDEC, 2006), do not have defined targets. Additionally, the goals for where to implement ESH management activities differ among the conservation initiatives working in New York State. The Golden-winged Warbler (Roth, Rohrbaugh, Will, & Buehler, 2012) and New England Cottontail (Fuller, Tur, England, & Technical, 2012) initiatives created focal areas for these species with restricted ranges, whereas the Ruffed Grouse Conservation Plan and the Partners in Flight Landbird Conservation Plan for Allegheny Plateau (Robertson & Rosenberg, 2003) do not identify focal areas and call for broad application of ESH management.

As part of my research, the project team brought together stakeholders at a workshop to remedy some of this ambiguity through establishing regional breakout groups for New York

State. At the end of the workshop, the participants affirmed the value of the existing focal areas for range-restricted species but otherwise determined that more work was necessary to establish focal areas for more widespread ESH species. This ambiguity on how much ESH and where will continue to serve as a barrier to coordinated conservation implementation and tracking of success. Additionally, it has slowed the New York State Department of Environmental Conservation in applying the results of this research.

Role of People in Maintaining ESH Species

ESH species rely on the activities of people for the maintenance and creation of their habitat. The abandonment of farms and pastures, timber harvest, maintenance of powerline corridors and other shrub habitats within forested landscapes are required for their existence (Askins, 2000). To some, this management reliance is troubling and seems "unnatural". However, this creation of ESH by people is not a new phenomenon, as it is believed that ESH species have relied on the creation of forest openings by people for at least a thousand years, with the Native American land use practices of agricultural clearing and periodic burning to promote hunting (Askins, 2000). Additionally, natural disturbance that once created ESH (e.g., beavers, wildfires) have been suppressed or eliminated in many areas and fragmentation of forest ownerships into smaller parcels has imposed logistical constraints on harvesting, making ESH even more dependent on purposeful management than historically (Brooks, 2003)

Role of Public Lands

While this research has focused on private lands, as seen in my calculations above, ESH conservation on public lands cannot be ignored if habitat targets are to be met. Seventy-seven percent of New York's forests are privately owned: 60% by individuals and families and 17% owned by industry, corporations, and private groups (Butler, 2008). Despite this pattern of forest

ownership, common but steeply declining ESH birds often have more than 85% of their distribution on private land in the East, with the exception of Golden-winged Warbler (at 70%). (North American Bird Conservation Initiative, 2011). This unbalanced species distribution tracks unbalanced habitat distribution. While 12.2% of the private land in New York is in seedling-sapling stage, only 4.6% of public land is in seedling-sapling stage (Miles, 2013). Thus, private lands currently provide a disproportionate amount of habitat for ESH-reliant species.

To some, this statistic means that the stewardship of ESH species is particularly important on private lands if we are to maintain the current habitat base. Others find it to be problematic and question why the very public agencies that are interested in ESH conservation are not leading by example. Their lack of participation gives the impression that ESH management is too burdensome or politically sensitive for the state agencies, which raises the question of how can they expect private landowners to bear that burden instead. In states like Massachusetts there has been considerable public outcry associated with ESH management on public lands, but this conflict has not been widespread in other states. In several states the forestry divisions are distinct from the wildlife divisions, causing disconnects in prioritization of forest management for wildlife on public lands. If these constraints were overcome, not only would public lands managed for ESH contribute to ESH goals but they could also become educational demonstration sites that encourage private landowners to conduct the same management.

Limitations

There are a few caveats and limitations to this dissertation research worth noting. First, my research focused on the Southern Tier of New York State and while insights can be applied to other areas, the results cannot be fully generalized to landowners in other geographic regions.

Particularly problematic is that the areas where funds for ESH private lands conservation efforts with New York landowners are currently most available (i.e., the St. Lawrence River Valley – a Golden-winged Warbler focal area – and a portion of the Hudson Valley – a New England Cottontail focal area) do not fall within the Southern Tier. While many of the laws and regulations for private lands may be similar in these other areas, local-level harvest restrictions are increasing and may be present in these areas. Additionally, landowner cognitions about wildlife and land management may differ, as may the prevalence of forest management activity, particularly in the more populated and urban Hudson Valley area.

Due in part to the property tax database, respondents to my survey were far more likely to be male than the population as a whole. This potential gender bias is a common challenge in landowner research. How problematic it is in this study is unknown, as the applicability of this research depends on the forest management decision-maker in a household answering this survey. The decision-maker may indeed be the landowner listed in the property database, who is more often male, or decision-making could be shared between spouses or family members, or role of the female alone. I could have partially dealt with this issue by addressing the cover letter to the decision-maker for the land (rather than the owner) owned in the Southern Tier (or, in the case of multiple owners listed with the parcel, alternating between male and females).

The description of the specific proposed behavior in the survey also limits the applicability of the results. First, the study team determined that it would be appropriate to ask landowners about cutting ½ acre or more. However, prescriptions for cuts tend to be considerably larger than this size – often about five acres, depending on the wildlife species for which the cuts are being created. It is not possible to determine from my results whether landowner response would be the same for larger cut sizes. Additionally, I did not refer to these

cuts as “clearcuts” as they are often known, given that the term has negative connotations. I would expect that if “clearcut” was used, a portion of the landowners might have reported lower likelihood to engage in the behavior and less favorable cognitions. While it might be possible that avoidance of that term is beneficial to landowner outreach efforts, it might also be that opponents of such landowner outreach would wage a counter-effort and refer to the behavior as clearcutting, which could likely change the outcome of landowner outreach.

Future Research

Private landowner cognitions and behavior related to even-aged management and ESH are complex and merit additional research, particularly in areas where funds are being applied to work with landowners on this issue. My dissertation provides a foundation for such further inquiry, particularly in understanding the drivers of landowner behavioral intention and application of these cognitions to typologies and ultimately landowners’ likelihood to act in response to the availability of tools of public action. Similar research in other areas of New York would serve to guide that work with landowners and would also offer a comparative baseline as efforts to engage landowners are implemented. The need for research to evaluate the effectiveness of the application of typologies through field-based and possibly experimental design-based research could also be satisfied in these locations.

Additionally, the unexpected findings in this research (i.e., that only attitudes predicted behavioral intention rather than the other direct determinants – norms and perceived behavioral control – and that all types of landowners preferred learning tools) warrant additional scrutiny. I suspect that these findings were due to the unique characteristics of this behavior, particularly that this even-aged management conflicts with what most landowners believe benefits their land and wildlife. Similar findings might be found related to using controlled burns for forest

management, given that fire also has negative connotations for forest health.

Lastly, for understanding the role this research (and other similar social science research) will play in bridging the implementation gap in ESH conservation, I suggest more research on conservation implementation results and whether social science was involved, how, and at what point. Currently, it is challenging to find published literature that illustrates whether inclusion of social science truly improves conservation outcomes when the results are applied.

Closing

As habitat loss continues and wildlife populations continue to decline, the future of wildlife conservation will increasingly rely on the actions of private landowners. To effectively engage private landowners in conservation, social science will also become increasingly essential to understand private landowner behavior, which landowners are potentially interested in behaviors that can benefit conservation goals, and how to best work with these landowners toward conservation goals. This dissertation provides one of the first examples of how new approaches to social science research can provide important insights to future researchers as well as to conservation agencies, organizations, and initiatives.

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APPENDIX A. SURVEY RESPONDENT AND NON-RESPONDENT COMPARISON

Table 1. Landowner and land characteristics differences between mail survey respondents and non-respondents according to t-test.

	Respondent		Non-respondent			
Item	M	SD	M	SD	df	t
Acres in 1st parcel	91.26	129.01	96.90	90.21	1126	-.425
Years own 1st parcel	25.69	19.73	25.31	16.76	1118	.185
Distance from 1st parcel	68.21	211.84	52.59	304.78	1103	.669
Acres in 2nd parcel	66.50	110.48	52.81	51.09	373	.800
Years own 2nd parcel	22.66	19.43	21.44	14.63	365	.397
Distance from 2nd parcel	49.44	208.47	23.40	65.00	364	.813
Acres young forest	10.05	19.27	17.84	30.44	100.01	-2.44*
Acres mature forest	47.17	74.12	29.411	40.69	159.76	3.71 ***
Year born	49.56	12.47	50.21	12.89	1096	-.652

*p<.05; **p<.10; ***p<.001

Note: acres of young forest and acres of mature forest items did not include image for phone survey as they did for mail survey.

Table 2. Landowner and land characteristic differences between mail survey respondents and non-respondents according to Chi-square significance test and Cramer's V effect size measure.

Item	Pearson Chi-square	p-value	Cramer's V
Own woods to provide wildlife a place to live	21.96	<.001	.142
Own woods for land investment	12.54	.008	.108
Own woods to pass on to heirs	13.22	.004	.110
Own for use of timber products	8.21	.042	.087
Own woods for farming	14.30	.003	.115
Own woods for hunting/fishing	5.47	.140	.071
Own woods for birding/birdwatching	28.91	<.001	.163
Will cut patch in next 5 years	19.78	<.001	.136
Will cut scattered in next 5 years	34.76	<.001	.180
Gender	2.31	.129	.045
Education	27.72	<.001	.158

Table 3. Prevalence (%) of four levels of importance among mail survey respondents and non-respondents for providing wildlife a place to live as a motivation for owning land.

Level of importance	Respondent	Non-respondent
Not at all important	2.8	12.1
Slightly important	11.8	10.1
Moderately important	31.9	27.3
Very important	53.5	50.5

Pearson's chi-square =21.96***; Cramer's V=.142.

Table 4. Prevalence (%) of four levels of importance among mail survey respondents and non-respondents for land investment as a motivation for owning land.

Level of importance	Respondent	Non-respondent
Not at all important	28.7	36.7
Slightly important	26.5	14.3
Moderately important	26.9	21.4
Very important	18.0	27.6

Pearson's chi-square =12.54**; Cramer's V=.108.

Table 5. Prevalence (%) of four levels of importance among mail survey respondents and non-respondents for passing on to heirs as a motivation for owning land.

Level of importance	Respondent	Non-respondent
Not at all important	14.6	16.3
Slightly important	20.6	6.1
Moderately important	25.9	26.5
Very important	38.9	51.0

Pearson's chi-square =13.22** Cramer's V=.110.

Table 6. Prevalence (%) of four levels of importance among mail survey respondents and non-respondents for own use of timber products as a motivation for owning land.

Level of importance	Respondent	Non-respondent
Not at all important	34.5	43.4
Slightly important	29.5	18.2
Moderately important	24.8	22.2
Very important	11.2	16.2

Pearson's chi-square =8.21* Cramer's V=.087.

Table 7. Prevalence (%) of four levels of importance among mail survey respondents and non-respondents for farming as a motivation for owning land.

Level of importance	Respondent	Non-respondent
Not at all important	40.6	28.3
Slightly important	19.2	12.1
Moderately important	19.7	27.3
Very important	20.4	32.3

Pearson's chi-square =14.30**; Cramer's V=.115.

Table 8. Prevalence (%) of four levels of importance among mail survey respondents and non-respondents for hunting/fishing as a motivation for owning land.

Level of importance	Respondent	Non-respondent
Not at all important	19.6	24.2
Slightly important	14.3	13.1
Moderately important	21.2	28.3
Very important	45.0	34.3

Pearson's chi-square =5.47; Cramer's V=.071.

Table 9. Prevalence (%) of four levels of importance among mail survey respondents and non-respondents for birding/birdwatching as a motivation for owning land.

Level of importance	Respondent	Non-respondent
Not at all important	19.3	42.4
Slightly important	27.4	19.2
Moderately important	30.8	20.2
Very important	22.5	18.2

Pearson's chi-square =28.91***; Cramer's V=.163.

Table 10. Prevalence (%) of four levels of likelihood of cutting patches of trees in the next five year among mail survey respondents and non-respondents.

Level of likelihood	Respondent	Non-respondent
Not at all	47.2	65.6
Slightly	27.6	9,4
Moderately	13.7	9.4
Very	11.4	15.6

Pearson's chi-square =19.78***; Cramer's V=.136.

Table 11. Prevalence (%) of four levels of likelihood of cutting scattered single trees in the next five year among mail survey respondents and non-respondents.

Level of likelihood	Respondent	Non-respondent
Not at all	13.8	33.7
Slightly	27.6	16.3
Moderately	24.0	10.2
Very	34.6	39.8

Pearson's chi-square =34.76***; Cramer's V=.180.

Table 12. Prevalence (%) of gender among mail survey respondents and non-respondents.

Gender	Respondent	Non-respondent
Male	82.2	76.0
Female	17.8	24.0

Pearson's chi-square =2.31; Cramer's V=.045.

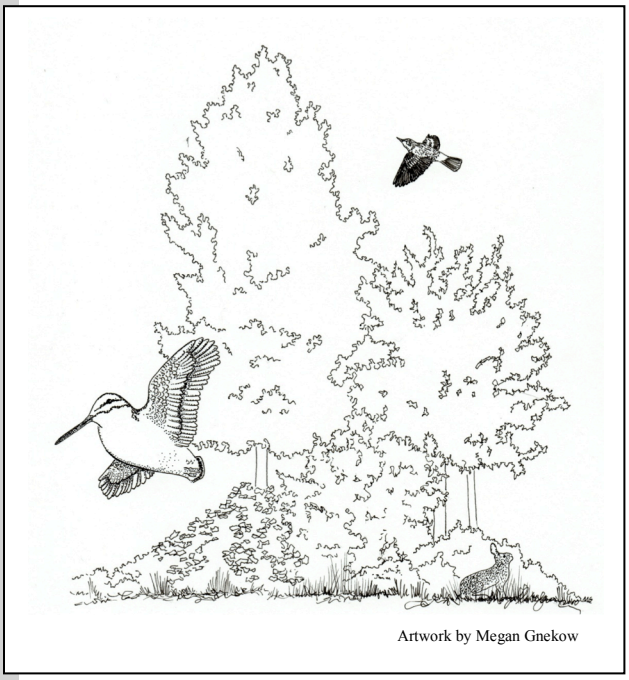
Table 13. Prevalence (%) of education levels among mail survey respondents and non-respondents.

Gender	Respondent	Non-respondent
Less than high school	2.6	11.1
High school/GED	23.3	24.2
Some college or technical	24.1	11.1
Associate's degree	12.6	12.1
College undergraduate degree	18.5	23.2
Graduate or professional degree	19.1	18.2

Pearson's chi-square =27.72***; Cramer's V=.158.

APPENDIX B. PROJECT REPORT FROM THIS RESEARCH INCLUDING RESEARCH INSTRUMENTS

New York's Southern Tier Landowners' Management for Early Successional Forest Habitat: Attitudes, Barriers, and Motivations



Artwork by Megan Gnekow

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EXECUTIVE SUMMARY

Background

Early successional forest habitats and species reliant on this habitat are in decline in New York State and throughout the Northeast. Shrublands and early successional forest habitats (ESH) can be defined as those sites with persistent shrubs or seedling to sapling-sized trees that are typically a response to some form of disturbance (Litvaitis, 2003). Active forest management can provide ESH in areas where there is no longer sufficient natural disturbance to produce enough ESH for wildlife dependent upon this type of habitat. Even-aged timber management techniques (e.g., group selection or clearcutting) are thought to be one of the most effective means for creating ESH. While the creation and maintenance of ESH is a critical conservation goal on both public and private lands, private lands are a key contributor given that over three-quarters of New York's forests are under private ownership.

Research Objectives

To inform education and outreach that supports landowners who seek to manage for ESH, the New York State Department of Environmental Conservation (NYSDEC) identified a need for research into private landowners' attitudes and behaviors related to ESH. In response, a project Contact Team composed of Cornell University researchers and NYSDEC staff was formed. The objectives for the research project were to:

1) Explore the state of knowledge and outreach related to ESH among experts working with private forest landowners.
2) Understand private forest landowner behavior, attitudes, knowledge, motivating factors, and constraints for different types of forest management practices on their lands.
3) Develop a typology of private forest landowners to inform engagement approaches for early successional habitat management.

Methods

The research focused on the Southern Tier region of New York State, which includes Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Cortland, Tioga, Broome, Chenango, Otsego, and Delaware counties. This region is heavily forested, and the majority of the forestlands are privately owned. This area was selected because the NYSDEC staff on the ESH project Contact Team determined it to be an area with limited ESH and ample mature forest where ESH could be created through forest management.

A mixed methods research approach incorporated both qualitative and quantitative phases: interviews of 29 professionals who specialize in research, outreach or management of ESH (experts); interviews of 32 landowners and a focus group with 6 landowners; and a mail survey with a sample of 2,500 landowners, of which 43% (n=1,036) responded. Data collection occurred from September 2009 to January 2011. Analyses of landowner responses to the mail survey compare small landowners (10-49 acres owned in the Southern Tier) to large landowners

(50 or more acres owned in the Southern Tier). The landowners were then segmented into 4 types based upon their past and future patch cutting behavior (i.e., "adoption" of the behavior): 1) non-adopters, 2) potential adopters, 3) past adopters, and 4) continuing adopters.

Summary of Results

Interviews with professionals and landowners. Defining ESH and its optimal characteristics for wildlife is a challenge even for professionals in the field. This definitional lack of clarity may impede the systematic achievement of ESH-related goals and objectives, or at least require greater clarification in their articulation. Yet, most experts do think of ESH as part of an ecological process that can be successfully created by people through land management techniques, primarily even-aged silvicultural practices such as clearcutting or patch cutting. This view of ESH and how to create it is not as prevalent among landowners – even among those currently managing for ESH. Far more landowners think of reverting fields when referring to ESH than do experts, and few landowners thought of ESH management as an ecological process. Most of the cutting undertaken by landowners we interviewed was thinning (a type of uneven-aged management that does not tend to result in forest regeneration that creates quality ESH) and not the patch cutting or clearcutting thought by professionals as more effective in creating ESH. Further, some of the interviewed landowners are not cutting at all yet believe their actions will effectively create ESH.

Landowners are largely undertaking ESH management to create wildlife diversity and habitat on their property, and many do this, at least in part, to increase the population of game species of interest. Fewer landowners discussed non-game species of interest on their property. Landowners believe they could be best assisted in their ESH management activities on their land by outreach/education and financial assistance.

Mail survey of landowners. The survey results provided additional information on landowner attitudes, behavior, constraints, and potential programs to encourage forest management for ESH. Approximately one-third of the sample was small landowners (10-49 acres) and two-thirds were large landowners (50 or more acres).

Generally, landowner respondents held more positive attitudes toward mature forest than other land cover types (including ESH types of young forest, shrublands, etc.). In the last ten years, over two-thirds of landowners had cut single trees throughout their property (which does not tend to create ESH), whereas about a third had cut at least ½-acre or larger patches of trees that they then allowed to regenerate (which is more likely to create ESH). Their intentions for future cutting followed this pattern as well: landowners were more likely to cut single trees throughout their property than a patch of trees in the next five years. These behaviors are consistent with landowners' attitudes. More landowners believed that cutting single trees scattered throughout their land is better for their land and for wildlife than is cutting a patch of trees.

Landowners perceived few constraints to cutting (in general) on their land, with time being the most commonly invoked barrier. Further, many landowners indicated that learning that patch cutting benefits wildlife would increase their likelihood to cut patches of trees on their land as

would receiving financial assistance or tax reduction. Yet, none of the existing information sources for managing one's land for wildlife influence landowners much.

In addition to these general trends that hold true for both small and large landowners, there were some slight differences between small (10-49 acres) and large (50 or more acres) landowners. Most notably, as compared to small landowners, large landowners may be more predisposed to cut trees to create or maintain ESH, and easier to reach with communications or other programs.

Landowners were segmented into four types of patch cut adopters based on their past behavior and likely future behavior: 1) non-adopters (had not conducted patch cuts in the past ten years nor do they intend to in the future; 37%), 2) potential adopters (had not conducted patch cuts but have some intention to do so in the future; 25%), 3) past adopters (had conducted patch cuts but do not have an intention to do so in the future; 5%), and 4) continuing adopters (had conducted patch cuts and have some intention to do so in the future; 23%). For outreach efforts, the greatest result would likely come from targeting potential adopters because they noted some interest in managing for ESH in the future but had not done so in the past. Continuing adopters are likely to continue their current management approach without support; and non-adopters and past adopters are unlikely to pursue management for ESH in the future. For potential adopters, time and money were greater barriers for them than they were for past and non-adopters. Finding a market for forest products, skilled help in conducting ESH, knowledge about ESH, and support for ESH management activities were greater issues for potential adopters than for the other three types. Thus, initiatives aimed at reaching potential adopters should focus on their identified needs of knowledge and advice or financial incentives and equipment related to ESH.

Conclusion

Currently, the majority of landowners do not show a propensity for ESH (particularly the shrublands element of ESH, as opposed to young forest) or the primary cutting approach that creates it (even-aged management). Yet, landowners are not resistant to cutting in general and report few barriers preventing them from doing so. The issue is that they largely believe that cutting single trees scattered throughout their property is better both for their land and for wildlife than is cutting patches of trees. In this vein, many landowners indicate that if they learned that cutting patches of trees benefited wildlife they would be more likely to do so. Additionally, financial support appears to be another means to address barriers identified by landowners to cut patches of trees to create ESH. A segment of landowners who we describe as potential adopters are those most in need of these types of support. The findings of this study can inform future programs to educate private landowners about ESH management and/or identify existing programs that may assist them.

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INTRODUCTION

In eastern forests, a crucial wildlife conservation issue is the decline of early successional forest habitat and associated species (North American Bird Conservation Initiative, 2009; NYSDEC, 2006). Shrublands and early successional forest habitats (ESH) can be defined as sites with persistent shrubs or seedling to sapling-sized trees that are typically a response to some form of disturbance (Litvaitis, 2003). Currently ESH and its obligate species are in decline in the Northeast. Taxa declining due to loss of ESH include plants (Latham, 2003), birds (Dettmers, 2003; Rosenberg & Burger, 2008), mammals (Fuller & DeStefano, 2003; Litvaitis, 1993; 2001); and reptiles (Kjoss & Litvaitis, 2001). Examples of such species include Golden-winged Warbler, American Woodcock, New England Cottontail, and other important game and non-game species.

Managing for ESH: A Need in New York State

The New York State, Comprehensive Wildlife Conservation Strategy (CWCS) highlights ESH as a habitat in need of conservation attention:

> Early successional forest and shrubland habitats are also in serious decline throughout the State. Land development is reducing habitat, natural succession is turning many of these habitats into forests, and shrublands are sometimes converted into agricultural fields. A traditional source of shrubland habitat has been the succession of abandoned farm pasture and crop fields into shrublands. The rate of farmland abandonment has slowed from peak rates in the mid-20th century, further reducing the potential for new habitats to form. There is a critical need to increase active management for these habitats and the species that rely on them (NYSDEC, 2006, p. 58-59).

Given the situation in New York, as is true as well throughout much of the northeast, active intervention and management is often promoted to create and maintain sufficient ESH to sustain wildlife populations that rely on it (Brooks, 2003). Active management (e.g., cutting) can provide ESH where restrictions on natural disturbance (e.g., windthrow, beaver flowages, wildfires) limit habitat creation through natural processes. Silvicultural practices vary in their effectiveness for creating ESH. Uneven-aged or selection approaches remove single or small groups of trees. These approaches often do not remove enough of the forest canopy to allow in adequate light for regeneration. In contrast, even-aged management (e.g., group selection or clearcutting), which involves clearing all of the trees in the area, is more likely to result in ESH.

ESH on Private Lands

Although the creation and maintenance of ESH has been identified as a critical conservation goal on both public and private lands, private lands are a key contributor given that 77% of New York's 18.6 million acres of forestlands is privately owned (Butler, 2008). According to Forest Inventory and Analysis data from 1946-1998, most of the seedling-sapling timberland was held in private ownership (Trani, Brooks, Schmidt, Rudis, & Gabbard, 2008). Specifically, New York had 16% of its timberland in seedling-sapling (the average for the Northeastern region as well) with about 90% of this forest type occurring on private lands.

The New York State CWCS emphasizes the role of private landowners in ESH conservation, making the connection to a need for education and outreach:

> Perhaps the most serious threat to these habitats and the species that rely on them is the lack of adequate management due to misconceptions about the benefits of sustainable forestry practices for wildlife. Much of New York State's forest lands are in private ownership, making public outreach and education an important tool in addressing this threat (NYSDEC, 2006, p.58-59).

Understanding the Human Dimensions of Private Landowners and ESH

To inform education and outreach that assists landowners' ESH management, the New York State Department of Environmental Conservation (NYSDEC) identified a need for research into private landowners' attitudes and behaviors related to ESH. Research focusing on the human dimensions of ESH is limited (Gobster, 2001). Gobster suggests people's responses to ESH can be predicted from existing research on timber (e.g., the importance of ESH tree species) and non-timber forest products (e.g., uses of berries, roots, etc., from ESH species), visual and aesthetic perceptions (e.g., preferences for large, mature overstory trees with lush understory and open midstory and negative attitudes toward clearcutting), and recreational use. Yet, he argues that our understanding of landowners' decision-making about this habitat and the management activities that create it is incomplete.

Responding to this deficit, Enck & Brown (2006) found that residents of the Great Northern Forest of the northeastern United States generally held positive attitudes toward early successional (defined as "0-20 years" in the survey) and late successional (defined as "100+ years" in the survey) stages of forest. Yet, in comparison, 37% of landowners held attitudes that were more positive toward late successional than early successional stages, and only 12% of landowners held attitudes that were more positive toward early successional than late successional stages. In addition to the more positive attitudinal responses to late successional forest, emotions were more positive towards late successional than early successional forest (Enck & Odato, 2008). Residents in the Great Northern Forest with positive attitudes toward ESH and use of timber management to sustain it also tended to hold positive beliefs about habitat and timber management in general. The authors also found that residents were largely unaware that ESH is declining. Another study on the HD of ESH, conducted focus groups with engaged landowners in the Northeast, suggesting that messaging about a diversity of wildlife requiring a diversity of habitats would be most effective for encouraging management activities for ESH (Case, Seng, & Christoffel, 2009).

Types of Landowners

Linking landowners' ESH-related attitudes and behavior to subsequent behavioral change requires understanding how landowners differ on key characteristics that drive their behaviors. There is little utility in understanding only the average landowner (Tuttle & Kelley, 1981); rather, understanding landowner types can inform programs that seek to influence landowners' forest management intentions and behaviors. Segmentation, or building typologies, helps

researchers and practitioners better understand the breadth of landowners and target programs, messages, and outreach approaches.

One of the first landowner typologies (Tuttle & Kelley, 1981) was based upon wildlife habitat improvement activity adoption -- non-adopters, low adopters, medium adopters, and high adopters. This typology fostered understanding of landowner wildlife management activities. The authors note the value of landowner typologies in educational program development. They argue for a future methodology that splits landowners into groups based on observed or likely habitat management behaviors: actual market (already adopted activities), potential market (receptive to adopting), and nonmarket (unlikely to adopt without large and long-term educational efforts). This approach helps inform programs to both retain those landowners who are undertaking the behavior and recruiting those landowners who may be likely to undertake the behavior. However, this typology strategy (or similar ones) has yet to be applied specifically to ESH management behaviors.

Research Objectives

The primary objectives of this project were defined by the project Contact Team composed of Cornell University researchers and NYSDEC staff as:

1) Explore the state of knowledge and outreach related to ESH among experts working with private forest landowners.

2) Understand private forest landowner behavior, attitudes, knowledge, motivating factors, and constraints for different types of forest management practices on their lands.

3) Develop a typology of private forest landowners to inform engagement approaches for early successional habitat management.

METHODS

This study employs sequential mixed qualitative and quantitative research methods. Mixed methods approaches have been recommended for effective research on private landowners (Bliss & Martin, 1989; Hodgdon, Cusack, & Tyrrell, 2007). Specifically, the suggested sequence for qualitative research and survey (Bliss & Martin, 1989) includes first using interviews to identify core concepts that later are adapted to use in survey instruments. Surveys may also verify patterns across a population and test hypotheses about relationships between concepts. Finally, the survey may also identify subpopulations that can be studied more intensively via subsequent qualitative research.

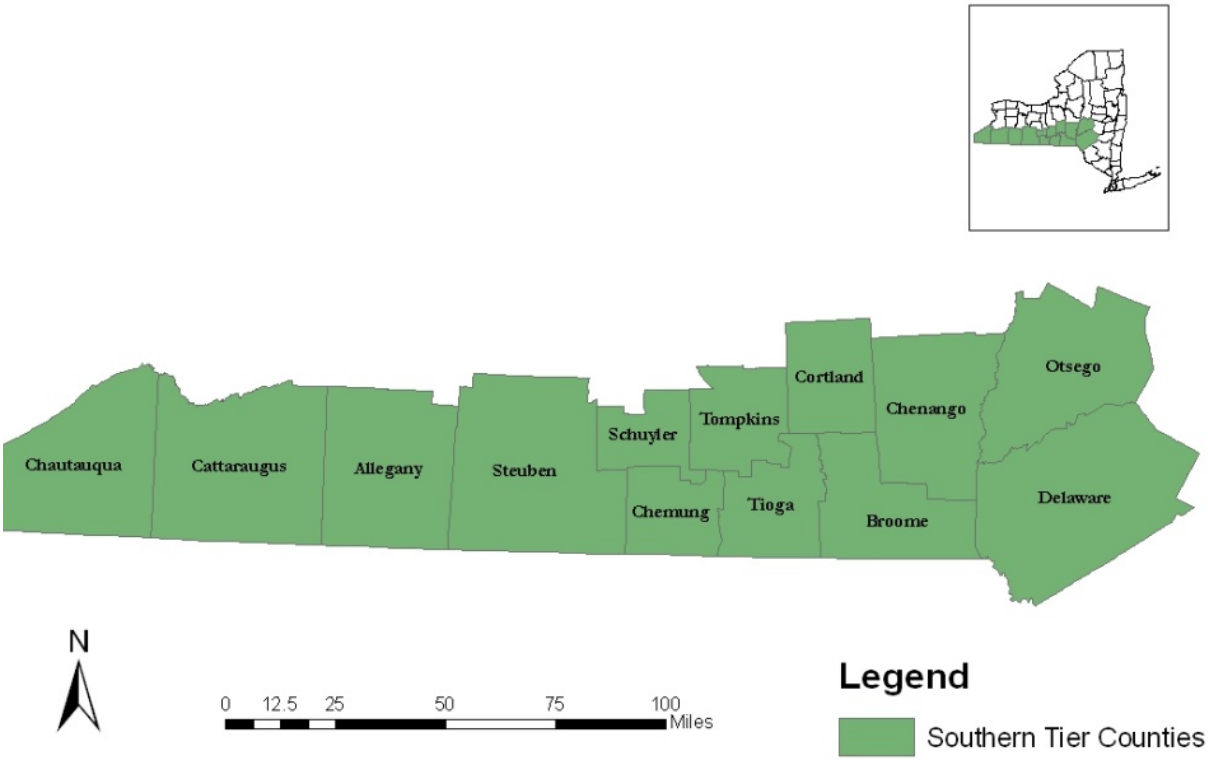
Accordingly, this study first employed qualitative research methods including interviews with subject matter experts – professionals who specialize in research, outreach, or management for ESH. Then the qualitative research focused on landowners, with interviews of landowners experienced in ESH management and a focus group with landowners inexperienced in ESH management. Each of these qualitative steps informed the subsequent stages of research. All of the qualitative findings then informed the design of the questions and response options in a mail survey. All of the phases of research were reviewed, under protocol 1006001472, by the Cornell

University Office of Research Integrity and Assurance and qualified for Exemption from the Institution Review Board.

Study Area

Our research focused on the heavily forested Southern Tier region of New York State. The Southern Tier includes Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Cortland, Tioga, Broome, Chenango, Otsego, and Delaware counties (see map below). This area was selected because the NYSDEC staff on the ESH project Contact Team determined it to be an area with limited ESH and ample mature forest where patches could be created through forest management. In the exploratory phase of our work, landowner interviews were conducted in the 13 Southern Tier counties as well as the neighboring. Our subsequent mail survey was strictly limited to the 13 Southern Tier counties. Of the forest lands in this region, the majority are privately owned.

Figure 1. New York State's Southern Tier counties included in this study.



Expert Interviews

We conducted semi-structured interviews with conservation professionals in forestry, extension, and wildlife (n = 29) in fall 2009 to develop an understanding of ESH and associated human dimensions research needs. Experts were identified through snowball sampling, starting with those known to the researchers: members of the New York State Department of Environmental Conservation Contact Team, Cornell Cooperative Extension forestry contacts, and the Conservation Science Department at the Cornell Lab of Ornithology. Additional contacts with experience in early successional habitat (ESH) conservation and/or working with private landowners were identified by the interviewees. Twenty-four interviews were conducted on the telephone, and five were conducted in person.

The interview questions (Appendix B) explored professionals' knowledge of ESH management needs and approaches, perceived challenges to such management, guidance for subsequent human dimensions research with private landowners, and existing outreach tools and resources.

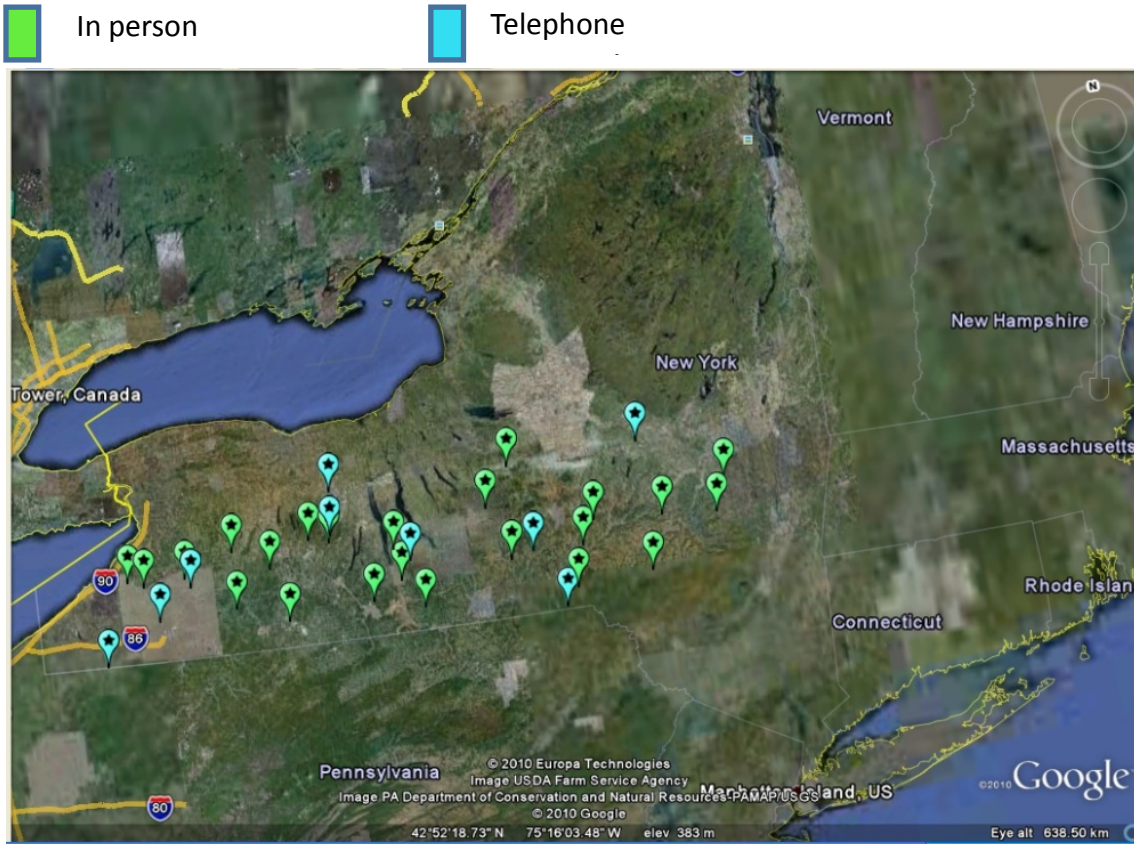
The responses to the questions were typed by the interviewer while the interview was being conducted. Data analysis was conducted using Atlas TI, through the process of thematic coding, where codes are identified and defined by reading the interview transcripts.

Landowner Interviews & Focus Group

To better understand the experience of those who were undertaking ESH activities on their land we conducted semi-structured interviews with 32 landowners in the Southern Tier or surrounding counties of New York State. These landowners reported they had experience managing for ESH. Because the expert interviews emphasized understanding landowners' attitudes and knowledge as a need for human dimensions research, we addressed the beliefs, attitudes, norms, and behaviors expressed by these individuals who had adopted ESH management. We were also interested in their perceived barriers for ESH management, support they received for management, and perceptions of other landowners' forest management behavior.

We recruited interviewees via a listserv announcement distributed to NY Master Forest Owner volunteers, NY Forest Owners Association members, members of Audubon chapters in New York, Natural Resource Conservation Service's program participants in ESH-related programs in Western NY, and National Wild Turkey Federation members. Our email recruitment included a request for individual, family, or club landowners who manage for ESH (defined as areas with grasses, shrubs, and up to small trees) on their property. Twenty-two interviews were conducted in person and ten were conducted via the telephone (see Figure 2 for locations of each type of interview). Interviews were conducted during spring 2009.

Figure 2. Map of landowner interviewees' land locations.



A semi-structured interview approach followed a relatively standardized protocol (Appendix B) with some flexibility for additional prompts, allowing us to pursue some question areas with greater depth. The questions addressed how landowners initiated ESH management activities on their land, their perceived support in this process, their management activities, and their likelihood of continued engagement. Our interviews explored the role of wildlife in landowners' goals for their land, their motivations for investing in wildlife habitat management, and their perceived challenges and successes. The interviews were digitally audio-recorded and later transcribed. Qualitative analysis of the interviews was conducted with thematic coding using Atlas Ti. Following the interviews, the landowners who wished to take the researcher on a walk of their property did so. On these walks, landowners showed the interviewer the ESH management activities they had undertaken on their land and explained their management strategies and outcomes. The interviewer also took photographs when permission was granted to do so. While the woods walks components were not analyzed, seeing the land and learning more from landowners in a casual setting provided the researcher with a deeper understanding of the property and the circumstances, allowing more information for thematic code development.

To better understand private landowners who are **not** currently managing for ESH but may have a propensity to do so, we conducted a focus group with those who own over 10 acres of woodland in New York and have an interest in wildlife, but who are not currently managing for ESH. The focus group was conducted at the New York State DEC office in Cortland, New York

(Cortland County) on July 22, 2010 from 7:00-8:30pm. We recruited participants through an email request to Audubon New York local chapters, Cayuga Birder listserv, Finger Lakes Land Trust, Ruffed Grouse Society, National Wild Turkey Federation, and Quality Deer Management Association. In exchange for participation, we offered wildlife and forest management printed manuals and brochures to participants. At the focus group we offered refreshments. Six people participated.

The focus group emphasized questions related to landowner participation in forest management and wildlife management on private lands (including activities as well as motivations and attitudes/value orientations that lead to them), perceived barriers to participation in ESH management and attitudes towards the role of private lands in wildlife conservation (Appendix B). We also asked about preferred sources and types of information and interest in outreach program participation. The focus group discussion was digitally audio-recorded and transcribed.

Landowner Mail Survey

Sampling

We conducted a mail survey of a stratified random sample of landowners in the Southern Tier of New York. The study population was defined as landowners of parcels of at least 10 acres of land in one of the thirteen Southern Tier counties of our study area. The project team determined that 10 acres should be the minimum criteria for property ownership size given current New York State DEC policies for forest management support. We drew our sample from tax code records obtained from the New York Department of Taxation and Finance Office of Real Property (ORP) Tax Services.

Past research has found that the amount of forested land owned influences forest owner attitudes, behaviors, and intentions (Butler, 2008). Accordingly, we sought to ensure that our sampling approach would provide us with an adequate number of responses from landowners of various size forests. Specifically, we drew our sample from two sampling frames to ensure large ownerships would be adequately represented. According to Butler (2008), 63% of NY woodland owners own a total of 1-9 acres; 28% own 10-49 acres; 6% own 50-99 acres; 4% own 100-499 acres; less than 1% own 500 acres or more. Thus, private forest ownership in New York State is disproportionately weighted toward people with small landholdings. To ensure an adequate number of large landholders in the sample, we created two distinct sampling frames based on parcel size: those who owned parcels of 50 acres of more in addition to those who owned parcels of 10-49 acres. From each sampling frame, we mailed surveys to 1,250 potential respondents (2,500 total).

We limited the selection of questionnaire recipients to parcels with Office of Real Property (ORP) tax codes that might include private forest landowners. We included land defined as agricultural vacant land (105), rural residence with acreage (240), primary residential, also used in agricultural production (241), estate (250), seasonal residences (260), rural (320), abandoned agricultural land (321), residential vacant land over 10 acres (322), and other rural vacant lands (323). We also included land designated as private wild and forest lands except for hunting and fishing clubs (910), forest land under section 480 of the real property tax law (911), forest land

under section 480-a of the real property tax law (912), and private hunting and fishing clubs (920). For our sample of landowners with parcels of 50 or more acres we also included lands defined by additional agricultural property codes, including livestock and products (110), dairy products (112), cattle, calves, and hogs (113), sheep and wool (114), other livestock: donkeys and goats (116), horse farms (117), and field crops (120). We included these additional agricultural lands for larger parcels given that agricultural lands in New York often have woods on a large portion of their land (USDA, 2007)—up to 50% if part of this tax code. Thus, for the larger parcels, a substantial acreage could be woods (25 acres or more). For a more complete explanation of how properties within these codes are defined, see http://www.orps.state.ny.us/assessor/manuals/vol6/ref/prclas.htm. We excluded properties that were business names, given our interest in individual or family forest owners.

Survey design and measurement

The mail survey instrument (Appendix B) examined landowners' behavioral intentions and past behavior (across all parcels of their land) to create a patch cut (of at least ½ acre) or conduct thinning – to compare even-aged and uneven-aged management. The former tends to lead to ESH, and the latter does not. The study team was interested in comparing these two types of behaviors. The survey instrument also measured indicators of behavior, attitudes, knowledge, motivations, and constraints for forest management practices described above. Before being finalized, the survey instrument was reviewed by the project Contact Team members, other natural resource social scientists, and landowners.

Data collection

Data were collected from November 2010 to January 2011 using mail-back questionnaires following a modified Tailored Design Method approach (Dillman, Smyth, & Christian, 2009) consisting of four mailings: cover letter and questionnaire, reminder postcard, cover letter and replacement questionnaire, and reminder postcard. One to two weeks passed between each of the mailings.

In total, 1,036 individuals responded to the survey (521 from the 10-49 acre strata; 514 from the 50 acre or more strata). After accounting for undeliverable surveys, the overall response rate was 43% (44% response rate from owners in the strata of 10-49 acres and 43% from owners in the strata of 50 acres or more).

Telephone Survey Non-response Bias Check

A telephone survey non-response check was administered by the Survey Research Institute at Cornell University (SRI) to a random sample of 50 non-respondents from each stratum in an effort to identify any non-response bias. The telephone survey included a subset of items from the mail survey to compare respondents and non-respondents. If the two groups differed substantially, then it would be necessary to weight the mail survey data to ensure it would be representative of the population. A list of 1,322 non-respondent names and addresses was provided to SRI; 645 of these records were identified as part of the 10-49 acres stratum and 677 were part of the 50 or more acres stratum. SRI identified non-respondent telephone numbers using whitepages.com. This search yielded telephone numbers for 250 members of the sample.

Data collection was conducted from January 11 to January 16, 2011. A total of 100 interviews was completed (50 in each group).

Analysis

Analysis was conducted using SPSS 19.0. Frequencies and means were calculated for each item (see Appendix A). Means for large and small landowners were compared using independent sample t-tests and Chi-square. Significant differences between the groups at the $p < .05$ are noted. To design the landowner typologies based on adoption behavior, we assigned participants to one of four categories based upon current behavior and future behavioral intentions: (1) those who have not conducted patch cuts in the past and have no likelihood of doing so in the future [non-adopters]; (2) those who have conducted patch cuts in the past but have no likelihood of doing so in the future [past adopters]; (3) those who have not conducted patch cuts in the past but report at least a "slight" likelihood of doing so in the future [potential adopters]; and (4) those who have conducted patch cuts in the past and report at least a "slight" likelihood of doing so in the future [continuing adopters]. Means for adopter types were compared using one-way ANOVAs with Dunnett's T3 pot-hoc comparison. Significant differences between the groups at the $p < .05$ are noted, as well as which groups are different from each other.

RESULTS

Expert Interviews

Interviews conducted with 29 experts (as described earlier) provided insight into the state of knowledge and outreach related to ESH.

Knowledge of ESH

Definition of ESH. Experts we interviewed primarily defined ESH as part of the ecological process of regeneration or succession, often mentioning a specific stage or phase (Table 1). For example, one expert explained: *"Any type of habitat that requires disturbance in order for the habitat to be maintained over time."* Some references were more detailed, as another expert explained: *"Concepts of ecological succession…where after significant disturbance you have transition of one type of habitat to another. A gradient, a seamless transition. In NY, start at the beginning: bare soil, forbs and grasses, herbaceous species, then woody, then mature trees, and then climax forest. Then the climax forest would have disturbance and open habitat--could be a large disturbance (hurricane or fire)--and then start over."* Interviewees also frequently equated ESH with a named habitat type, such as grasslands or shrublands, or the type of vegetation in it (e.g., woody growth, shrubs).

Despite the common characteristics of the definition, some experts acknowledged that ESH is challenging to define. The least frequently mentioned aspects of the definition included the tree size (e.g., within a certain diameter at breast height [DBH]), the wildlife found in ESH, the age of trees in ESH, and the amount of canopy cover.

Table 1. Themes for experts' definition of early successional habitat (n = 26).*

Most	
	Ecological process (19)
	Habitat type (14)
Some	
	Vegetation type (12)
	Defining is a challenge (9)
	Management approach (8)
Few	
	Canopy cover (5)
	Tree age (5)
	Wildlife (4)
	Tree size (3)

*Ordered by frequency of number of experts mentioning theme.

Optimal Characteristics of ESH for Wildlife. Experts commonly referenced a diversity of wildlife and vegetative species as part of the optimal characteristics of ESH for wildlife (Table 2), such as: *"For wildlife in general…diversity of species composition (forbs, grasses, shrubs, young trees) and also having diversity of species structure (low lying vegetation to those that are more structurally solid). To give a broad base of species in the habitat they need from ground nesting birds to those that nest up higher."*

Despite the prevalence of this theme, most experts also explained that it was a challenge to answer this question. They explained that it depends on the particular wildlife species managed for, such as *"Habitat specific, species specific…depending on where are in the state. What works for Bobwhite Quail in southern part of state, won't work for Woodcock or Brown Thrasher…."* The challenge may come from differences in property characteristics instead, as one expert explained: *"Every property is different. 'There isn't one magic formula,' I tell landowners."*

Other characteristics included structural diversity (i.e., horizontal and vertical forest stand structure), a planned approach to management (including a management plan to attract desired wildlife or management that includes rotation for ESH), pioneer tree species, habitat needs (e.g., food and cover), and native vegetation (as opposed to exotic).

Table 2. Themes for experts' perceptions of the optimal characteristics of ESH for wildlife (n = 25).*

Most	
	Diversity of wildlife & vegetative species (15)
	Depends on wildlife species (13)
	Challenge to answer (13)
Some	
	Structural diversity (7)
Few	
	Planned management (6)
	Pioneer tree species (6)
	Habitat needs (food, cover) (6)
	Native species (5)

*Ordered by frequency of number of experts mentioning theme.

Creation or Maintenance of ESH

Success in Creation or Maintenance of ESH. Our expert interviewees primarily identified successful ESH with specific techniques used for its creation, most commonly some type of cutting and less commonly natural means of regeneration or burning. References to cutting sometimes referred to the equipment itself, as this expert stated: *"Hydroaxes, chainsaws, heavy equipment. You can only do so much if just chainsaws. Bigger equipment is more effective to get more land."* Many experts seemed to believe that cutting was a simple way to success with assured results: *"If you do cutting, species will come."*

Expert interviewees also frequently mentioned the role of financial underpinnings of ESH success on private lands (through incentives or markets), as one expert stated: *"Landowners listen when you pay. There are two kinds of landowners…those who own 25 acres or less for their own enjoyment (hunting, recreation, small food plot but not primary source of income) and those with more land who use as primary source of income and can make money with rental, grow beef, hay, sheep, etc. Since it's their primary income, they need to make money to do this work on their land."* Additionally, species-specific approaches and forest planning were often-mentioned ingredients for success (Table 3).

Table 3. Themes for experts' perceptions of what leads to successful creation of ESH (n = 27).*

Most	
	ESH creation techniques (21)
Some	
	Economics of ESH (10)
	Species specific (10)
	Forest planning (10)
	Support landowner (7)
	Management (7)
Few	
	Awareness and attitudes of ESH (5)
	Habitat needs (3)
	Agency involvement (2)
	Demonstration (2)
	Easy (1)

*Ordered by frequency of number of experts mentioning theme.

Challenges to ESH Creation. Experts overwhelmingly believed landowner knowledge deficits and attitudes impeded ESH creation (Table 4). They emphasized the challenge of landowners' perceptions of the appearance of ESH and clearcutting, as an expert stated: *"Getting people past the initial visual impact from a cut forest. We have more mature forest in the East than we've ever had. But it is the big one [challenge]. Emotional response to the timber industry is pitiful. Visual, emotional attachment."* Experts felt landowner knowledge was lacking related to how ESH management will turn out, how to manage for it, and what makes a healthy forest. One expert explained: *"It is a struggle to get landowners to cut; current mindset is it is best to leave land."* Similarly, another noted: [Landowners are] *"loathe to cut anything. Cut a tree, kill a chipmunk."* Economic challenges were also referenced by many experts, including landowner costs of management maintenance, or the lack of a financial market for wood products.

Table 4. Themes for experts' perceptions of the challenges to ESH creation (n = 27).*

Most	
	Landowner knowledge and attitudes (21)
Some	
	Economic (11)
	Ecological (7)
	Management (7)
Few	
	Communication (5)
	Spatial landscape (2)

*Ordered by frequency of number of experts mentioning theme.

Human Dimensions Research Needs

Needs for ESH Research. Expert interviewees identified many human dimensions research needs, reflecting their perception that people's attitudes and lack of knowledge were the greatest challenges to ESH conservation. The human dimensions research needs most commonly referenced landowner attitudes (Table 5), including attitudes towards aesthetics of ESH, the amount of land a landowner is willing to have as ESH, clearcutting, ESH management activities, the necessity of ESH management activities, the wildlife agency, neighbor cooperation, preservation vs. conservation, and types of wildlife species. Also perceived as lacking was research on persuasion and attitude change mechanisms to encourage ESH management. Experts tended to believe that if the attitudes of landowners were better known, then communications with landowners about managing for ESH would be enhanced. One explains: *"If we could find out the root problem or concern that landowners have that would be behind why they don't like brush or why they think a cut looks bad or why they think it would hurt species, then it would be easier to talk about how ESH benefits species."* Experts also commonly discussed the need to study landowner knowledge, including knowledge of clearcuts, forests, management activities and wildlife and their habitat needs.

Table 5. Themes for human dimensions research needs (n = 22).*

Most	
	Landowner attitudes (21)
	Persuasion (14)
Some	
	Landowner knowledge (11)
	Priorities for property (10)
	Constraints to behavior (9)
	Incentives (8)
	Source of Information (6)
Few	
	Best management practices (5)
	Non-landowner groups (4)
	Economics (4)
	Evaluate effects (3)
	Expectation of results (3)
	Differences of types of Landowners (2)
	Landowner norms (2)

*Ordered by frequency of number of experts mentioning theme.

Summary

Experts we interviewed largely considered ESH to be part of an ecological process. Yet, many also found it challenging to define. Similarly, while the optimal characteristics included a diversity of plants and wildlife, experts tended to find optimal characteristics difficult to articulate because what might be considered "optimum" depends on particular management

objectives. Many believed there are well-established creation techniques for creating ESH, with cutting being the most successful mechanism. Yet, they also found forest planning, financial gain, and species-specific goals to be critical to successful creation and maintenance of ESH. The greatest challenge was believed to be landowner knowledge and attitudes. In this vein, the greatest human dimensions research need expressed was better understanding of landowner attitudes and how to influence them.

Landowner Interviews & Focus Group

Interviews were conducted with 32 landowners who self-identified as currently managing for ESH. Additionally, a focus group was conducted with a group of six landowners who did not identify as managing for ESH.

Landowner Interviewee Characteristics

The landowner interviews provided insights into the common characteristics of those managing for ESH on their lands. It should be noted that site visits to approximately two-thirds of these properties revealed a broad range in the extent of ESH management including clearcuts with successful, extensive regeneration, leaving fields to regenerate with limited success, and thinning with limited regeneration. Thus, landowners engaged in ESH management represent a spectrum from those undertaking a great deal of active management to those with passive management.

Proximity to Woodlot. More than half of the landowners we interviewed lived on their land. Very few considered themselves to live there part of the year or seasonally. The remaining respondents were absentee landowners that did not live on their land.

Goals and Priorities for Woodlands. Landowners overwhelmingly described wildlife habitat as a goal or priority for their woodlands. As one landowner explained, *"Well, my number one goal is to make it more sustainable for the habitat. Naturally, I'm a hunter so I want the land to be as healthy and productive as it can be to foster….a good mix and healthy herds of animals, whatever's there. There's a pretty good mix there now, so I want to do what I can to make it better and promote the birds and small game and big game to live there."* Also cited frequently as a goal were timber products to sell. This goal was often linked to the desire for financial gain as another landowner articulated: *"Obviously I want to try to manage the timber as well so I can, you know, get that kind of financial aspect*." Additional goals of importance to landowners were hunting or fishing, outdoor recreation not associated with wildlife, farming, forest products other than timber, and activities to improve the land (Table 6).

Table 6. Landowners' goals for their woodland (n = 32).*

Most	
	Wildlife habitat (23)
Some	
	Timber products to sell (15)
	Hunting or fishing (9)
Few	
	Non wildlife-related recreation (8)
	Farming or agriculture (6)
	Non-timber forest products (4)
	Improvement (4)
	General recreation (3)
	Demonstration (3)
	Experiential learning (3)
	Pass off to heirs (3)
	Timber products for family use (3)
	Maintaining the land (2)
	Wildlife observation (2)
	Bird watching (1)
	Enjoy the scenery (1)
	Investment (1)
	Land conservation (1)
	Solitude (1)

. *Ordered by frequency of number of experts mentioning theme.

Outdoor Recreation. Landowner interviewees revealed the types of outdoor recreation they engage in on their woodland and elsewhere. Hiking was most common followed by hunting. A large portion of the landowners also referred to their land management activities as recreation. The remaining array of activities was undertaken by a small number of landowners (Table 7).

Table 7. Landowner outdoor recreation activities (n = 32).*

Most	
	Hiking (20)
	Hunting (17)
Some	
	Land management activities (12)
Few	
	Fishing (8)
	Wildlife watching (8)
	Other (7)
	Skiing/snowshoeing (7)
	Camping (5)
	Canoeing/kayaking/rowing (4)
	Off-roading (3)
	Educating (3)
	Learning (3)
	Swimming (3)
	Birdwatching (2)
	Photography (2)
	Snowmobiling (1)
	Horseback Riding (1)

*Ordered by frequency of number of experts mentioning theme.

Incentives or Easements for Property. Less than half of our interviewees participated in incentive programs or had easements on their properties. Landowners participated in an array of Natural Resource Conservation Service programs and general, unnamed tax incentive programs (Table 8). Yet, no single program had more than a few landowners participating. Even more notably, the majority of these incentives and easements are not specifically targeted toward ESH.

Table 8. Landowner participation in incentive and easement programs (n = 32).*

Few	
	Incentive: Wildlife Habitat Incentives Program (4)
	Incentive: Forest Land Enhancement Program (4)
	Incentive: Stewardship Incentive Program (3)
	Incentive: Environmental Quality Incentives Program (3)
	Tax break: 480A (3)
	Incentive: Other (2)
	Incentive: Unnamed cost sharing program (1)
	Incentive: Conservation Reserve Program (1)
	Incentive: Landowner Incentive Program (1)
	Incentive: Unnamed timber stand improvement (1)
	Incentive: Unnamed watershed forestry program (1)
	Incentive: Unnamed wildlife habitat (1)
	Tax break: Other (1)
	Tax break: Write off expenses (1)
	Wind (1)
	Gas (1)
	Agricultural easement on taxes (1)
	Oil (1)

*Ordered by frequency of number of experts mentioning theme.

Types of Wildlife on Property. When asked what types of wildlife they have on their property, all landowners mentioned at least one game animal but not at all landowners mentioned at least one non-game animal. Many landowners named species that are ESH specialists. Yet, it is notable that ten landowners did not name any species on their property that are ESH specialists despite these landowners self-identifying as managing for ESH on their lands. This lack of ESH wildlife mentioned may partially be due to the variability in the extent of ESH management witnessed on these properties during the site visits.

Landowners and ESH

Definition of ESH. Landowners interviewed most commonly defined ESH according to some type of vegetation, such as a tree or bush species (Table 9). Following that, many landowners referred to an old field or an abandoned field or a field regenerating on its own. As a landowner explained, *"…it would be abandoned farmland, so it would be open, and it would slowly revert to something like brushy and early successional pioneer species of trees. And where that ends up is driven by further manipulation and the constituent species that are involved."* Some landowners also referred to the type of management activity needed to create ESH. There was also recognition among some landowners that ESH is part of an ecological process and reliant on disturbance. These references tended to be less technical than those of the experts, such as this quote from another landowner: *"And it's a natural progression of very small things getting a little bigger, and then they overtake. And then the small things are dying out into the medium range."*

Table 9. Landowners' associations with the term ESH (n = 32).*

Most	
	Vegetation type (20)
Some	
	Field (15)
	Management approach (10)
	Ecological process (9)
Few	
	Canopy cover (8)
	Tree size (7)
	Wildlife type (6)
	Tree age (5)
	Habitat type (2)

*Ordered by frequency of number of experts mentioning theme.

Activities for ESH. Landowners discussed various management activities that they undertake that they believe create ESH (Table 10). The activities mentioned by the greatest number of landowners were thinning and planting, followed by brush-hogging and mowing. Few landowners referred to clearcutting, removing invasive plants, or letting fields revert. Building brush piles, hinging/girdling trees, bulldozing, creating enclosures to protect young growth from deer or tubing young trees, and releasing apple trees by cutting competing trees and shrubs were also mentioned.

Table 10. Landowner ESH management techniques (n = 31).*

Some	
	Thin (13)
	Plant (12)
	Brush-hog/mow (11)
Few	
	Remove invasives (6)
	Clearcut (6)
	Natural processes/Letting field go (6)
	Build brush piles (5)
	Hinge/girdle (4)
	Bulldoze (2)
	Create enclosures (2)
	Tree release (1)

*Ordered by frequency of number of experts mentioning theme.

Landowner Interest in ESH. Landowner interviewees explained why they want ESH on their land and what they are trying to achieve. Most were doing so to maintain or enhance wildlife diversity and habitat on their land. A landowner explained his understanding of ESH as a need for wildlife: *"Well, you know, wildlife needs that variety. That's the biggest thing. It needs the variety of different ages of forest, let me put it that way. So that's what we're trying to maintain here."* The next most prominent response was to attract wildlife to hunt. Another landowner

linked the habitat needs with attracting wildlife for hunting: *"Nesting, food, cover, yeah. And you know obviously attraction for, for hunting."* (Table 11).

Table 11. Landowner motivations for ESH on their land (n = 28).*

Most	
	Wildlife diversity/habitat (20)
Few	
	Attract wildlife to hunt (6)
	Aesthetics (4)
	ESH belongs (4)
	Enjoyment/place to walk around (3)
	Forest product income (2)
	Unintentionally occurred (2)
	Attract wildlife for watching (1)
	Doesn't want ESH (1)
	Improvement of woodland (1)

*Ordered by frequency of number of experts mentioning theme.

Where Landowners First Heard About ESH. When asked about how they first learned about ESH, landowners most commonly mentioned some type of literature or written material. They also named a variety of non-profit organizations and universities as their sources —more commonly than they named a government agency. Other responses given are shown in Table 12.

Table 12. Landowners' information sources where first heard about ESH (n = 32).*

Some	
	Literature (15)
	NGO (12)
	University/College (12)
Few	
	Government organization/Agency (8)
	Exposure (7)
	School (5)
	General classes/seminars (3)
	Other landowners (3)
	None (2)
	Web-based (2)
	Private wildlife consultant (1)
	Rural Landowner Workshop (1)
	Television program (1)
	Listserves (1)

*Ordered by frequency of number of experts mentioning.

Barriers to ESH Management. The majority of landowners we interviewed perceive at least some barriers to engaging in ESH work, while a number do not perceive any barriers. Among barriers most commonly mentioned were the physically challenging nature of the work,

difficulty controlling results, and lack of time (Table 13). Financial and technical (money or equipment) barriers were mentioned less often.

Table 13. Landowner barriers to ESH management (n = 31).*

Some	
	None (11)
	Physically challenging (8)
	Control (8)
Few	
	Time (7)
	Money (5)
	Decision-making (3)
	Equipment (3)
	Difficult to get help (2)
	Long-term results (1)

*Ordered by frequency of number of experts mentioning theme.

Agency Support of ESH. Landowners expressed many ideas for how agencies might support them in creating ESH. The most prominent response for how agencies could support landowner creation of ESH was outreach and education (for example, ESH specific information, expert advice), followed by financial assistance (including tax breaks and incentives). Many additional ideas surfaced from just a few landowners, such as labor or equipment or recognition (Table 14).

Table 14. Potential agency actions (n = 32).*

Most	
	Outreach and education (17)
Some	
	Financial assistance (14)
Few	
	Labor (3)
	None (3)
	Learning about programs (3)
	Knowledgeable professionals (2)
	Equipment (1)
	Help finding a forester (1)
	Encouragement (1)
	Recognition (1)
	Resources in one place (1)

*Ordered by frequency of number of experts mentioning theme.

Landowner Focus Group

We faced a challenge in recruiting landowners that were not participating in ESH management to participate in focus groups. The landowners who responded tended to have more knowledge and experience with ESH (although not all of them), despite our recruitment letter calling for those without experience. Additionally, we sought an even mix of hunters and wildlife watchers but

only one member of the focus group was not a hunter. Thus, our focus group provided us with minimal additional insights beyond what we found in the landowner interviews (as the characteristics of the participants are not dissimilar to the interviewees) and thus we did not conduct extensive analysis of the focus group data.

We highlight here a few useful insights from the focus group as to how landowners not engaged in ESH management might differ from those that are purposively managing for ESH. First, we learned that those who are not managing for ESH may include those who recently moved to the Southern Tier from the New York City metro area, those who believe their land is too small; those who are more interested in the quick returns in attracting wildlife that food plots can offer; those who are so informed that they are reluctant to take action as they believe that results may be compromised by poor regeneration or invasive species; or those who are still gathering information and likely to act soon. Second, ESH did not tend to be called such by this group. Instead, it was referred to as "browse", "shelter", or "edge". Third, the barriers to ESH management that they referenced were similar to what we had heard from the landowner interviews: cost, equipment, time, advice, education, and attitudes. We did hear an additional barrier of not having enough land to manage for ESH. Fourth, their information sources were also similar to the landowner interviews but with more of an emphasis on resources at Cornell University. The information sources they cited were web, email, written materials, landowner workshops, timber companies, Cornell Cooperative Extension, the NYSDEC, Cornell Lab of Ornithology, Cornell Vet School, and conservation organizations.

Summary of Interviews and Focus Groups

In review, qualitative research with landowners revealed that those who believe they are conducting ESH vary greatly in the extent to which they are actually doing so. While cutting is their primary activity to create ESH, it is often limited thinning, rather than cutting approaches (in patches or clearcuts) that experts believe succeeds in creating ESH. Further, many landowners who are not cutting nevertheless believe their actions will create ESH. Also divergent between landowners and experts is the definition of ESH, which is much more technical for experts and much more focused on vegetation type and old fields reverting for landowners. Landowners we talked with are largely undertaking ESH management to create wildlife diversity and habitat on their property. Many of these landowners—even among those currently participating in ESH management—experience some barriers to ESH management. Landowners believe they could be best assisted by outreach/education and financial assistance, even though participating landowners do not themselves experience these as important barriers.

Landowner Mail Survey Results

Landowner Profile

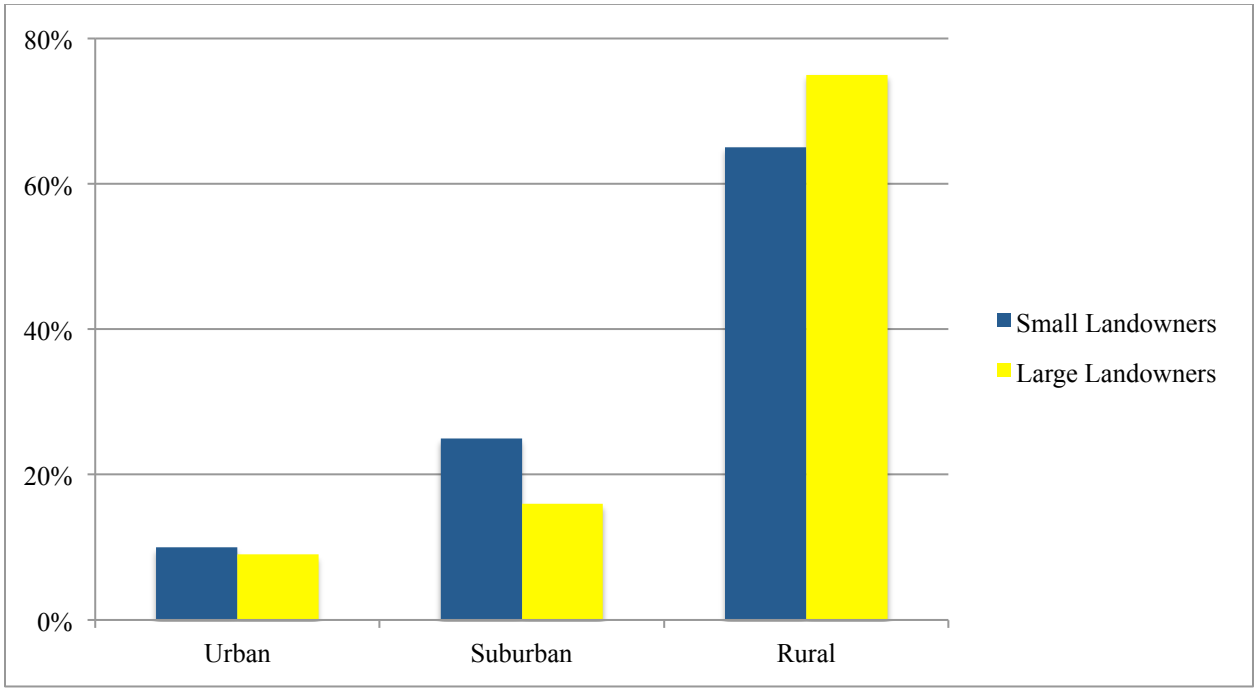
Thirty-three percent of responding landowners (n= 343) owned 10-49 acres in total (across all parcels owned) in the Southern Tier ("small landowners), while 67% (n = 686) owned 50 acres or more ("large landowners"). Given that landowners' reported parcel sizes did not always correspond to the sampling strata (i.e., 20% of those from small size strata did not report owning a parcel under 49 acres) and many landowners owned multiple parcels, landowners were

reassigned to groups for analysis based upon their reported total acreage from the survey. The average acreage owned for small landowners was 25 acres, compared to 175 acres for large landowners. More small landowners owned only one parcel in the Southern Tier (83%) than large landowners (60%). Only 13% of small landowners owned two parcels and another 4% owned three or more parcels. In comparison, 21% of large landowners owned two parcels, and 19% owned three or more parcels.

Small landowners had owned their land (averaged across all parcels) for an average of 19 years, while large landowners had owned their land an average of 25 years. More of the large landowners lived on at least one of the parcels they owned in the Southern Tier (62%) than the small landowners (53%). Overall, the average distance of their place of residence from their land (across all parcels owned) was greater for small landowners (74 miles) than it was for large landowners (66 miles).

The majority of landowners lived in rural areas—with more large landowners (75%) reporting living in rural areas compared to small landowners (65%). In contrast, more small landowners live in suburban areas (25%) than do large landowners (16%). An equally low percentage of landowners live in urban areas (10% of small landowners; 9% of large landowners; Figure 3).

Figure 3. Primary residence of large and small Southern Tier landowners.



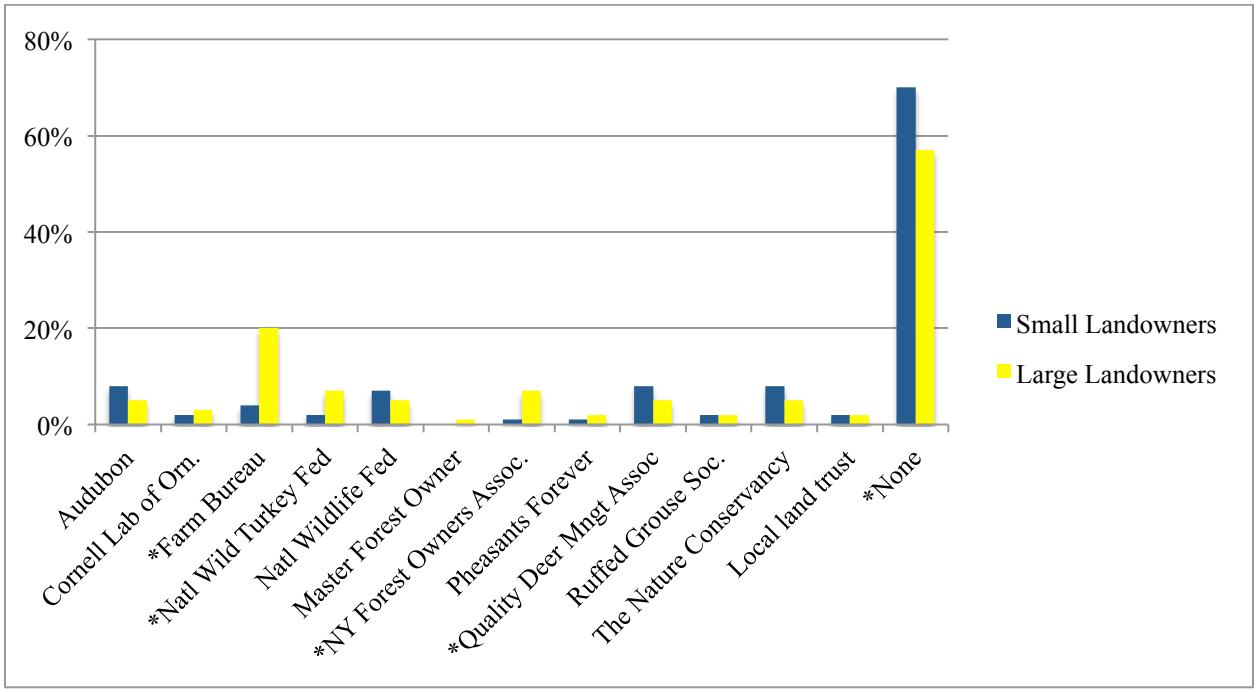
Statistically significant difference in distribution of residence by small and large landowners according to Pearson Chi-square, $p < .05$.

Most landowners responding to the survey were male (78% of small landowners; 84% of large landowners). The majority of the landowners had some college/technical school or less (50% for both small and large landowners). A similar number of small and large landowners had associates or college undergraduate degrees (29% of small landowners; 31% of large

landowners) and graduate or professional degrees (20% of small landowners; 19% of large landowners).

A majority of landowners (70% of small landowners; 57% of large landowners) did not belong to any wildlife or land conservation organizations (Figure 4). The most common organization for large landowners was the Farm Bureau (20%), suggesting a strong intermixing of forest and agriculture. In contrast, none of the organizations stood out as being as popular for small landowners. The greatest membership among small landowners was with Audubon Society (8%) and The Nature Conservancy (8%).

Figure 4. Wildlife or land organization membership of large and small landowners.

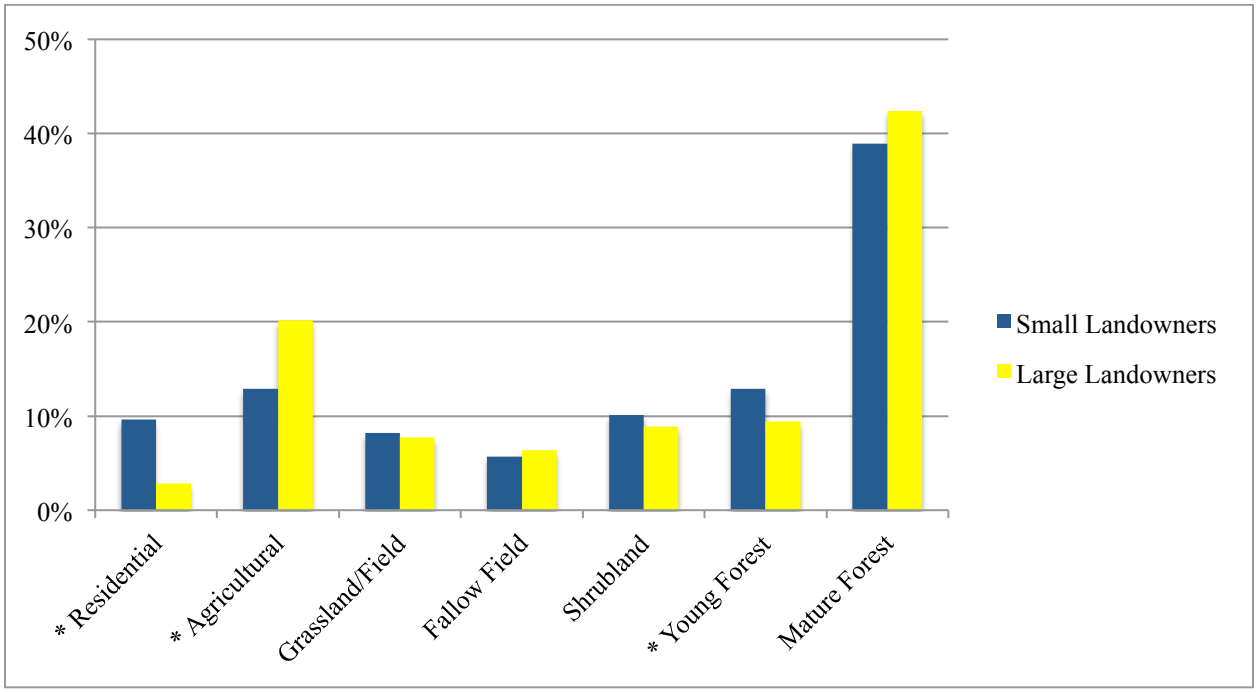


*Statistically significant difference between large and small landowners at p <. 05.

Land Composition

The most common type of cover on survey respondents' land was mature forest (39% for small landowners; 42% for large landowners). The next most prominent land type for large landowners was agricultural land (20%), while for small landowners it was young forest (13%) and agricultural land (13%). As might be expected, small landowners had a greater percentage of residential land than did large landowners (10% as compared to 3%; Figure 5).

Figure 5. Average percent of total land owned by large and small landowners for each land type.



Note those whose acreage in the various land types summed to a total acreage that differed by more than 10% from their total acreage in land parcels were removed from analysis.
*Statistically significant difference between large and small landowners at p <. 05.

Landowners preferred forest over other land types, with mature forest being most preferred (33% of small landowners and 38% of large landowners wanted more of this land type) followed by young forest (31% of small landowners; 29% of large landowners). Nearly as preferred was agricultural land (26% of small landowners and 31% of large landowners wanting more). Yet, for all land types, the majority of landowners wanted the same amount of that land type as they already had. The type of land that the most landowners indicated that they would like less of was shrubland (30% of small landowners; 35% of large landowners) followed by fallow field (21% of small landowners; 28% of large landowners) and young forest (17% of both small and large landowners), all categories that are strongly related to ESH (Figures 6 and 7).

Figure 6. Small landowner (10-49 acres) preferences for future land composition.

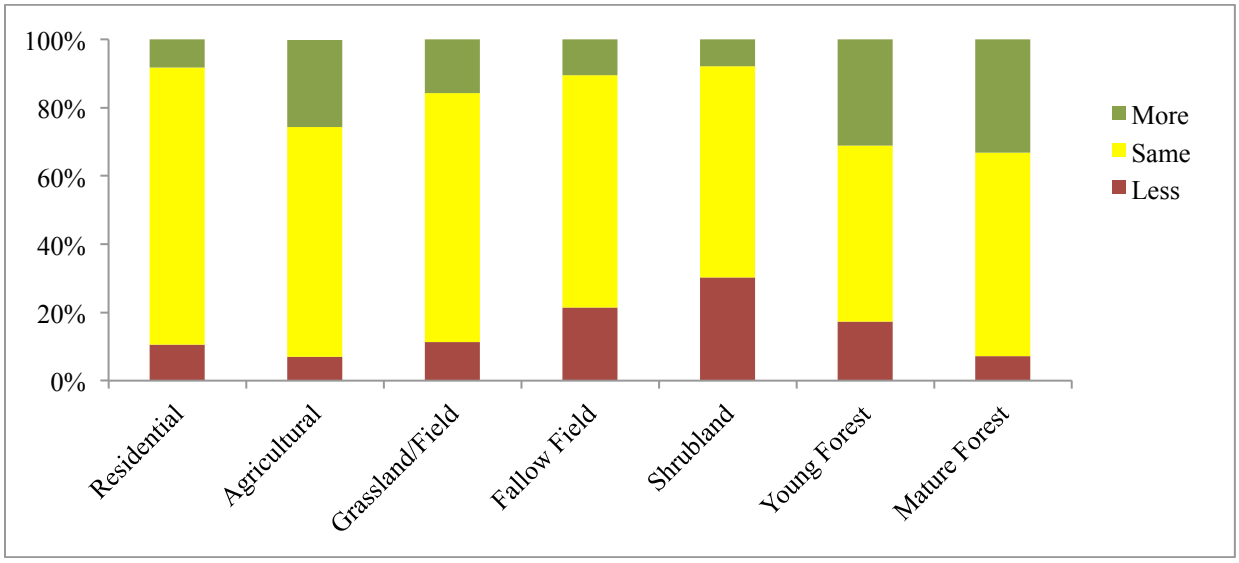
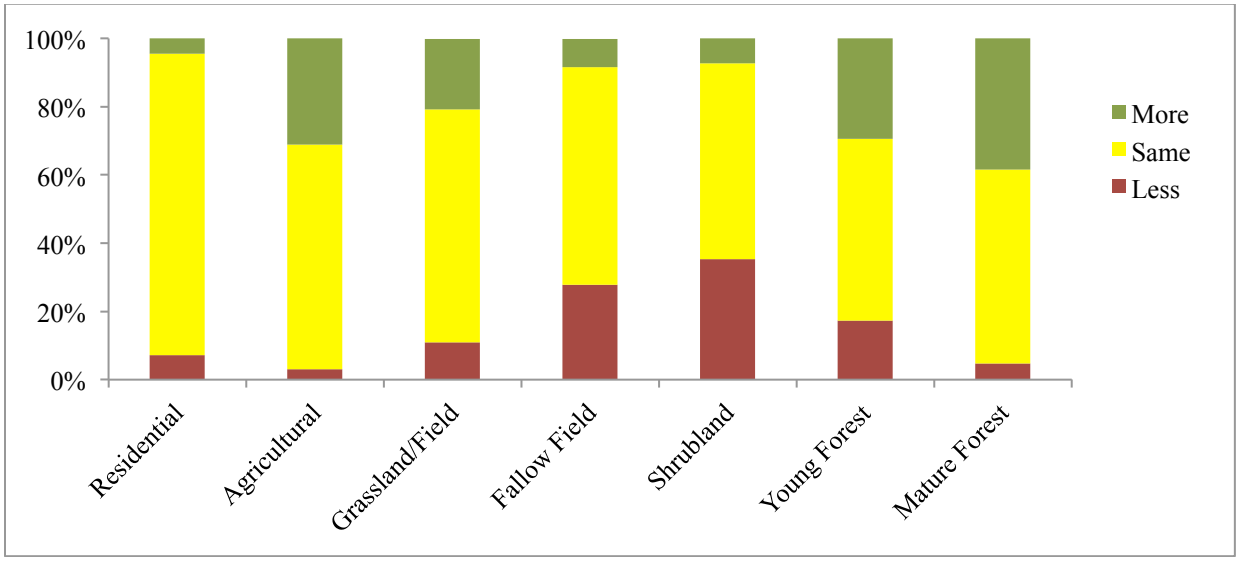
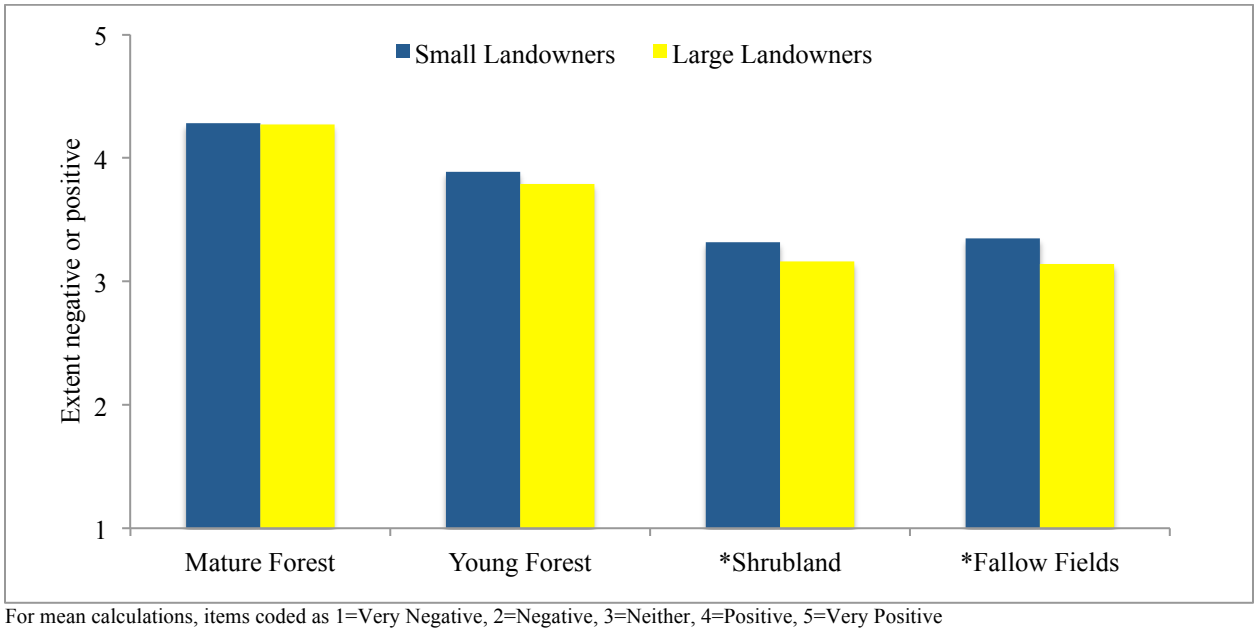


Figure 7. Large landowner (50 acres or more) preferences for future land composition.



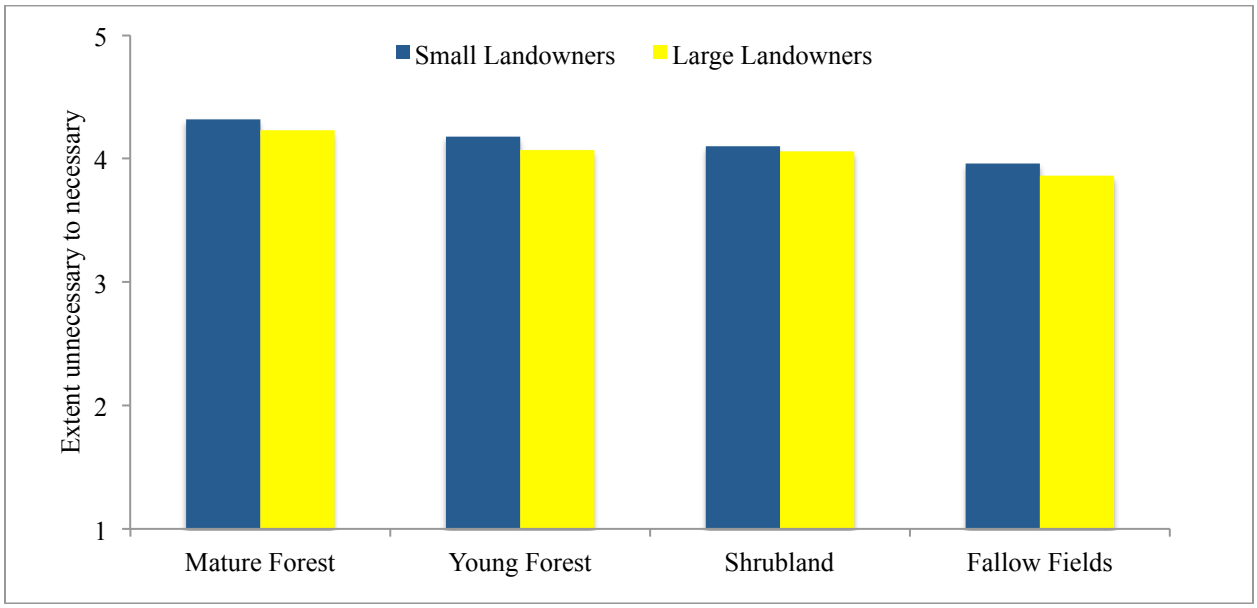
Landowners had the most positive attitudes toward mature forest and the least positive attitudes toward fallow fields and shrublands (Figure 8). Yet, when it came to how necessary landowners felt land types were for wildlife conservation, the distinction between their attitudes toward mature forest and other land types was not as strong (Figure 9). It therefore appears that the perceived necessity of shrublands and fallow fields for wildlife conservation is not playing a key role in overall preference for the land types. These trends were consistent for small and large landowners with large landowners having just slightly less positive attitudes toward shrubland and fallow fields.

Figure 8. Large and small landowner attitudes toward land types.



For mean calculations, items coded as 1=Very Negative, 2=Negative, 3=Neither, 4=Positive, 5=Very Positive
*Statistically significant difference between large and small landowners at p <. 05.

Figure 9. Large and small landowner attitudes toward land types for wildlife conservation.



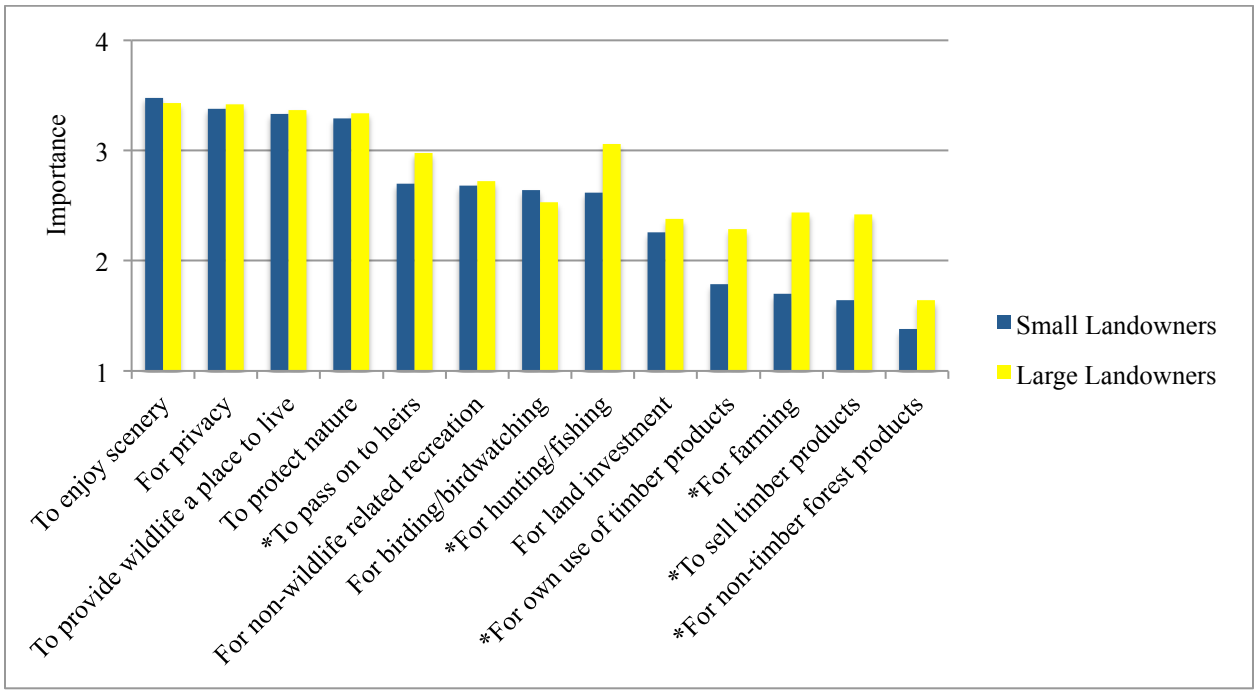
For mean calculations, items coded as 1=Very Unnecessary, 2=Unnecessary, 3=Neither, 4=Necessary, 5=Very Necessary
No statistically significant differences between large and small landowners at p <. 05.

Landowner Motivations

The most important landowner motivations for owning land in the Southern Tier included: “to enjoy scenery”, “for privacy”, “to provide wildlife a place to live”, and “to protect nature” (Figure 10). Small and large landowners were in agreement on these motivations. These groups

of landowners differed, however, with respect to other motivations. Large landowners found the following motivations more important than did small landowners: “to pass on to heirs”, “for hunting and fishing”, “for own use of timber products”, “for farming”, “to sell timber products”, and “for non-timber forest products”.

Figure 10. Large and small landowner motivations for owning land in the Southern Tier.

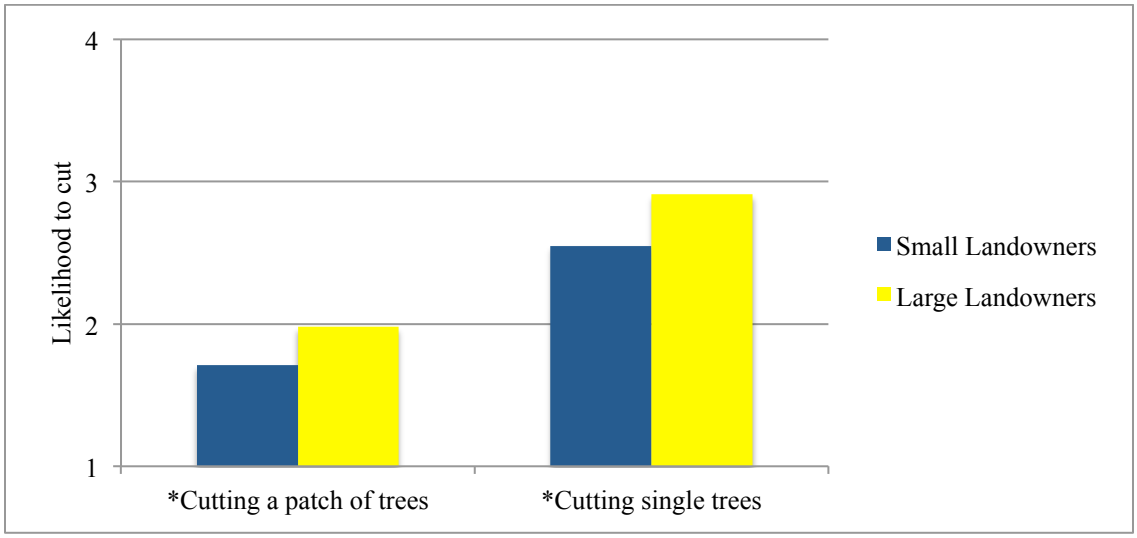


For mean calculations, items coded as 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important
*Statistically significant difference between large and small landowners at p <. 05.

Landowner Forest Cutting Behavior

Landowners’ history of cutting patches of trees versus cutting single trees was consistent with their assessment of the forest landscape: 80% of large landowners and 70% of small landowners had cut single trees in the past ten years, whereas only 35% of large landowners and 21% of small landowners had cut patches. Similarly, they reported far more likelihood, on average, to cut single trees on their land in the next five years than to cut patches of trees (Figure 11).

Figure 11. Large and small landowner likelihood of cutting behaviors in the next five years.

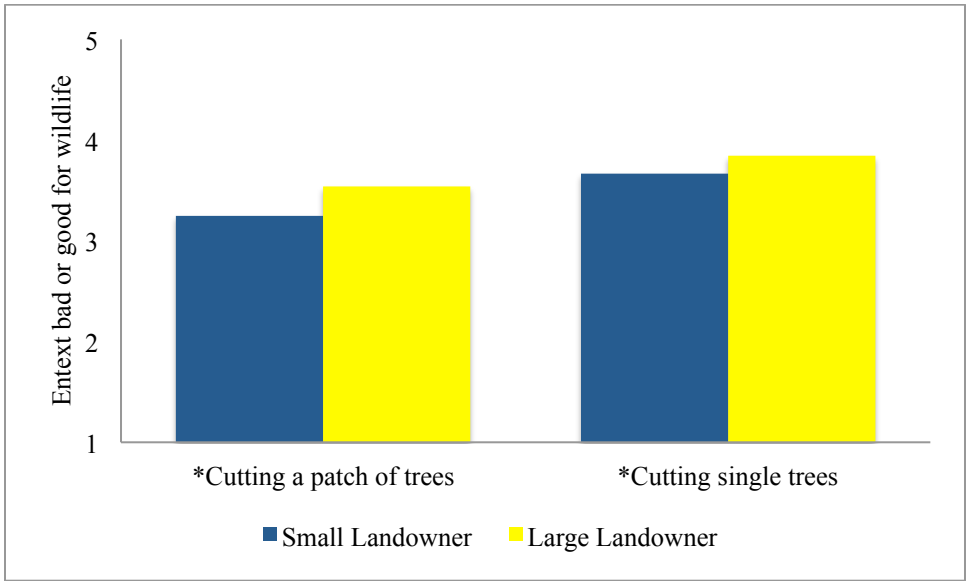


For mean calculations, items coded as 1=Not at all likely, 2=Slightly likely 3=Moderately likely, 4=Very likely
*Statistically significant difference between large and small landowners at p <. 05.

Landowner Attitudes toward Types of Cutting

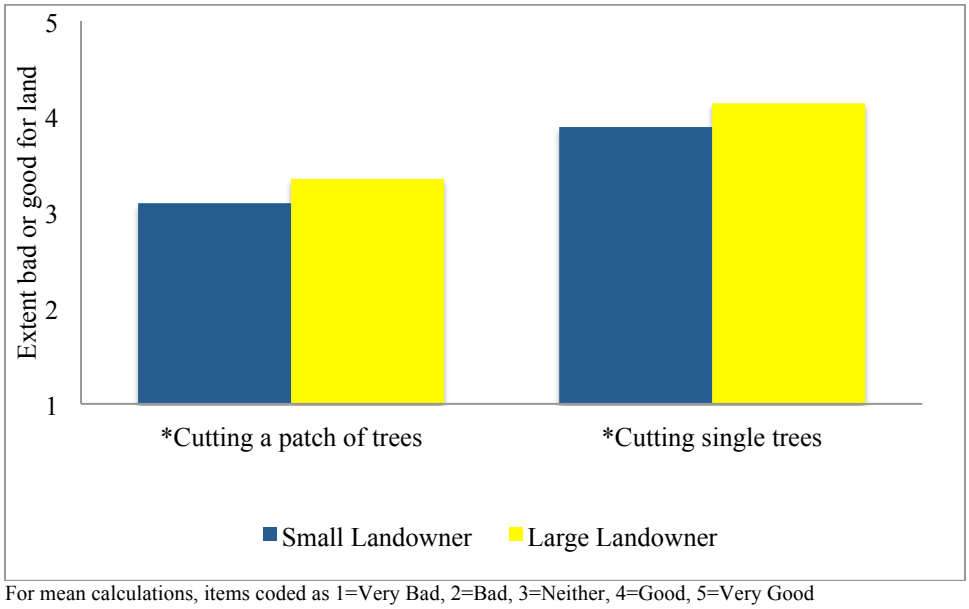
Similar to the patterns in their past behavior and future behavioral intentions, landowners believed that cutting single trees was better for wildlife than cutting patches of trees (Figure 12), even though they recognize the importance of ESH land types for wildlife, as seen in Figure 11 above, and have wildlife-related goals on their property (Figure 10). Likewise, they felt the same about the benefit of cutting approaches for their land (Figure 13). These patterns held for small and large landowners with large landowners seeing slightly more benefit to both types of cutting than small landowners.

Figure 12. Large and small landowners' perceived benefit of cutting activities for wildlife.



For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good
*Statistically significant difference between large and small landowners at p <. 05.

Figure 13. Large and small landowners' perceived benefit of cutting activities for land.

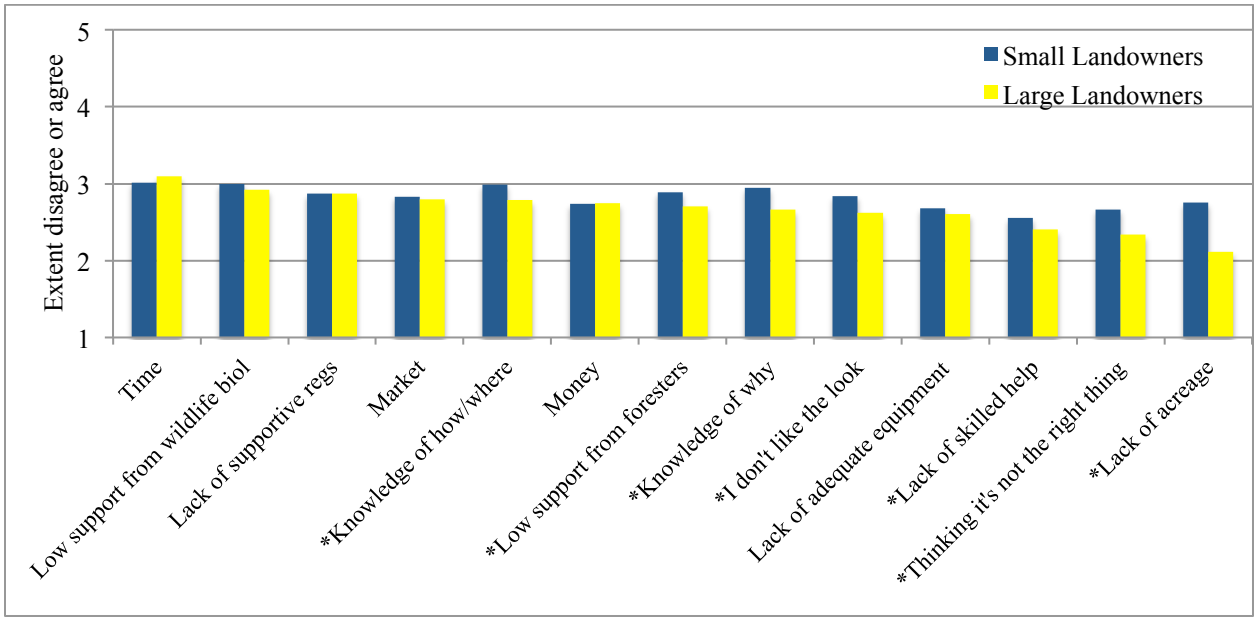


For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good
*Statistically significant difference between large and small landowners at p <. 05.

Cutting on Private Land: Barriers, Incentives, and Information Sources

Generally, landowners did not perceive that any barriers greatly limited the extent to which they cut their forest (note: any type of cutting), with all barriers (e.g., lack of money, market or knowledge) being between "neutral" and "disagree" on average (Figure 14). There were differences between small and large landowners, with small landowners reporting that some of the limitations affected them to a greater extent than did the large landowners (i.e., lack of acreage, knowledge of how/where, knowledge of why, low support from foresters, thinking it's not the right thing, and not liking the look of cutting on their land).

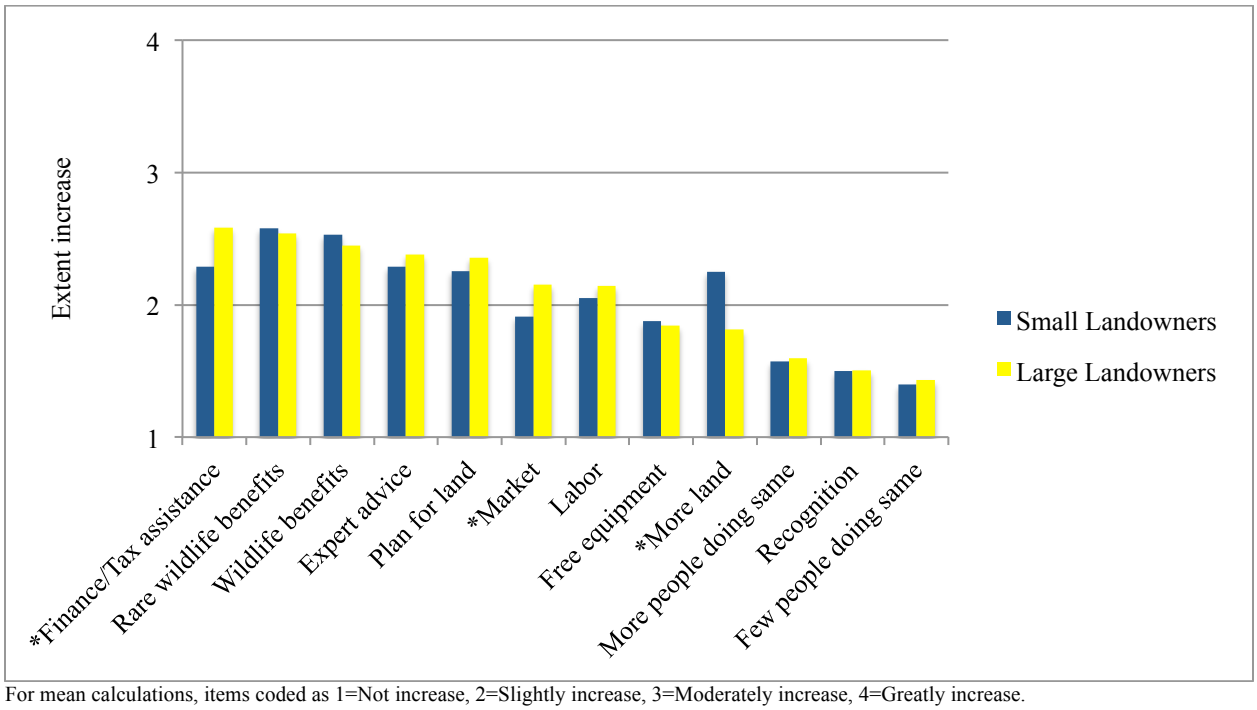
Figure 14. Large and small landowners' barriers to cutting on their land.



For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5 = Strongly Agree.
*Statistically significant difference between large and small landowners at p <. 05.

The three suggested factors that would most increase landowners' likelihood of cutting additional patches of trees on their land are financial or tax assistance, learning that the activity benefits rare wildlife, or learning that the activity benefits wildlife generally (Figure 15). Least influential factors included social influences: finding that few people in their area were doing so, earning recognition from a state agency or nonprofit, or finding more or fewer people in their area doing so. In general, few of the listed factors would result in increased landowner willingness to cut patches of trees. Differences existed between small and large landowners: small landowners were less interested in financial or tax assistance or a product market than large landowners. In contrast, small landowners reported they would be more likely to cut than did large landowners if they had more land.

Figure 15. Large and small landowners' assessment of factors that would influence their willingness to cut patches.



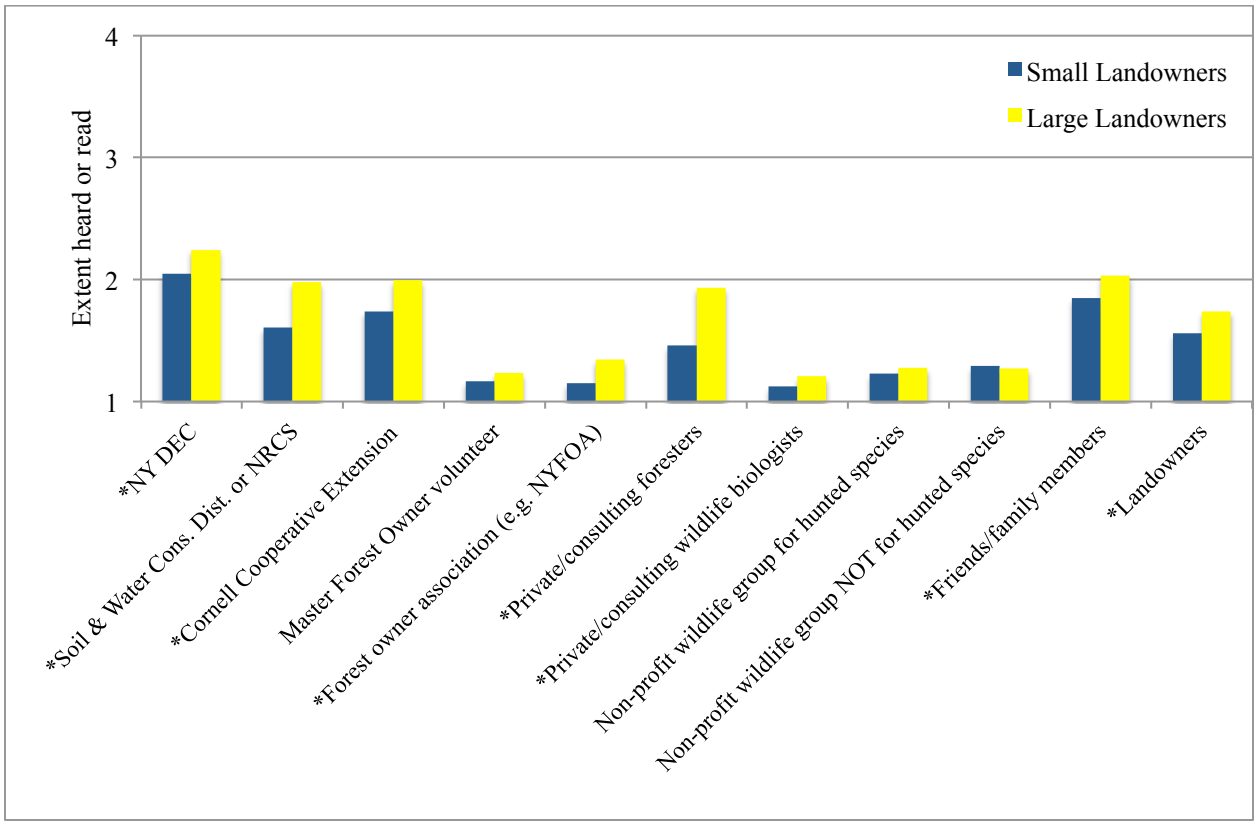
For mean calculations, items coded as 1=Not increase, 2=Slightly increase, 3=Moderately increase, 4=Greatly increase.
*Statistically significant difference between large and small landowners at p <. 05.

Information Sources

Most landowners reported that they had not heard or read much about wildlife and land management (Figure 16). The information source that landowners reported seeing or hearing from the most was the NYSDEC. Also relatively more common were friends and family, Cornell Cooperative Extension, and private/consulting foresters. Private/consulting wildlife biologists were the source landowners saw or heard from the least. Yet, small landowners tended to have heard or read less from all information sources considered than did large landowners.

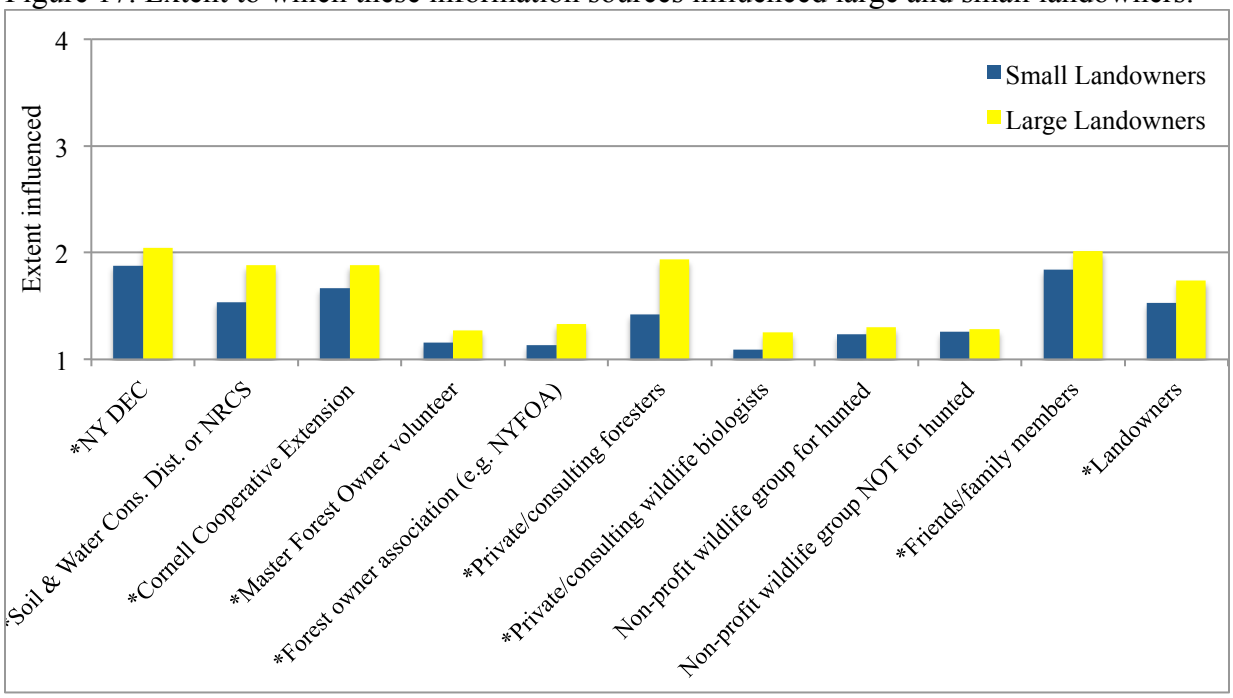
Similarly, none of these sources had more than a slight influence on landowners, on average. Further, nearly all of the information sources had a greater influence on large landowners than they did on small landowners (Figure 17).

Figure 16. Sources from which large and small landowners heard or read information about wildlife and land management.



For mean calculations, items coded as 1=None, 2=A little, 3=Some, 4=A lot.
*Statistically significant difference between large and small landowners at p <. 05.

Figure 17. Extent to which these information sources influenced large and small landowners.

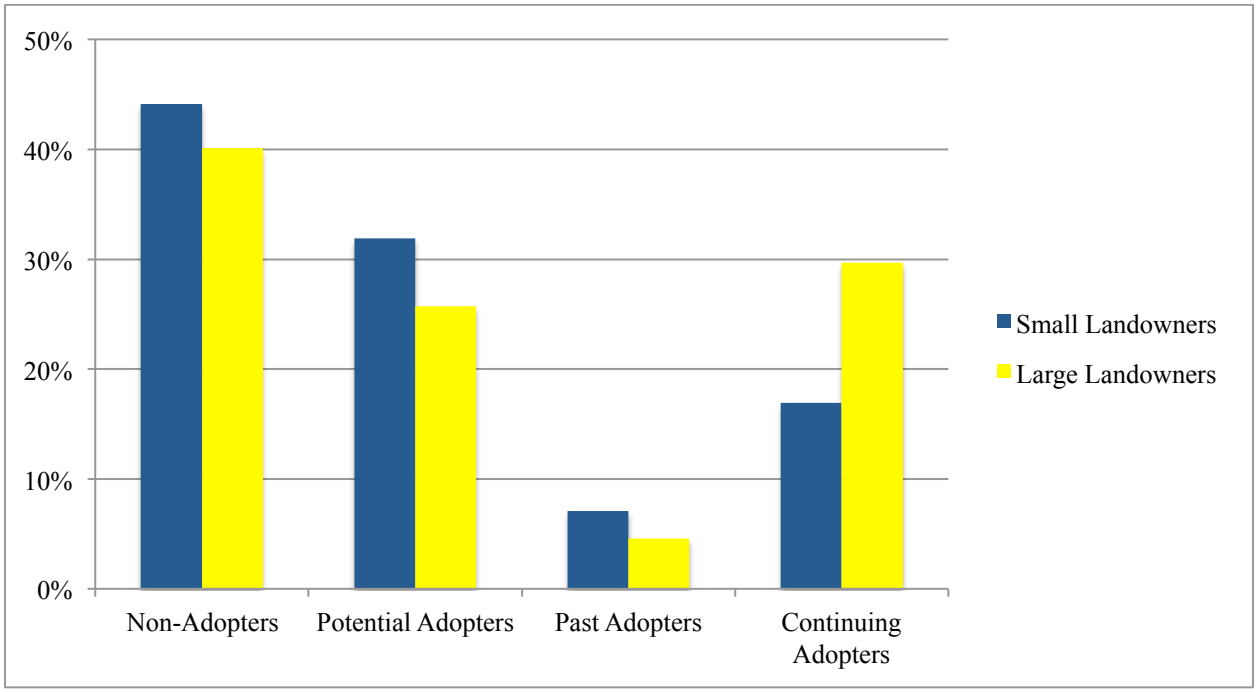


For mean calculations, items coded as 1=None, 2=A little, 3=Some, 4=A lot.
*Statistically significant difference between large and small landowners at p <. 05.

Landowner Patch Cut Adopter Types

A typology of private forest landowners was created based upon their past and future potential for adopting patch cutting behavior. This typology is intended to help target outreach for early successional habitat management. We found that the largest group of landowners--44% of small landowners and 40% of large landowners--was "non-adopters" of patch cuts, having not conducted the behavior in the past ten years and indicating no likelihood of doing so in the next five years. The smallest group of landowners--7% of small landowners and 5% of large landowners--was "past adopters", having conducted the behavior in the past but indicating no likelihood of doing so in the future (suggesting some dissatisfaction with their past experience with patch cuts). Yet, 32% of small landowners and 26% of large landowners were "potential adopters", having not conducted the behavior in the past but indicating at least some likelihood to do so in the future. Only 17% of small landowners compared to 30% of large landowners were "continuing adopters", having conducted the behavior in the past and indicating likelihood to do so in the future. While we summarize the differences between these types of landowners by combining the two sizes of landowners (due to small numbers in each type when divided by size), it should be noted that the distribution by landownership size does differ (Figure 18 below).

Figure 18. Percentage of large and small landowners by patch cut adopter types.



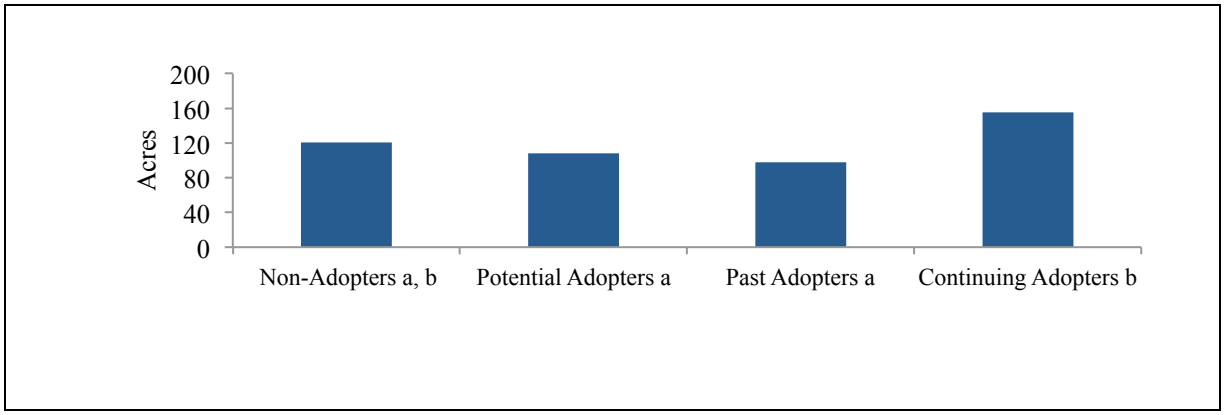
Statistically significant difference in distribution of patch cut adopter types by small and large landowners according to Pearson Chi-square, p <. 05.

Landowner Characteristics by Patch Cut Adopter Types.

There are some notable differences in landowner characteristics across our four adopter types. Notably, the continuing adopters own more land than the other three adopter types (Figure 19). A slightly higher percentage of non-adopters than other types live in rural areas, and a slightly higher percentage of potential adopters live in suburban areas (Figure 20). Regarding education, more past adopters, more so than other types, have completed some college or technical school, and a higher percentage of potential adopters have a graduate/professional degree (Figure 21).

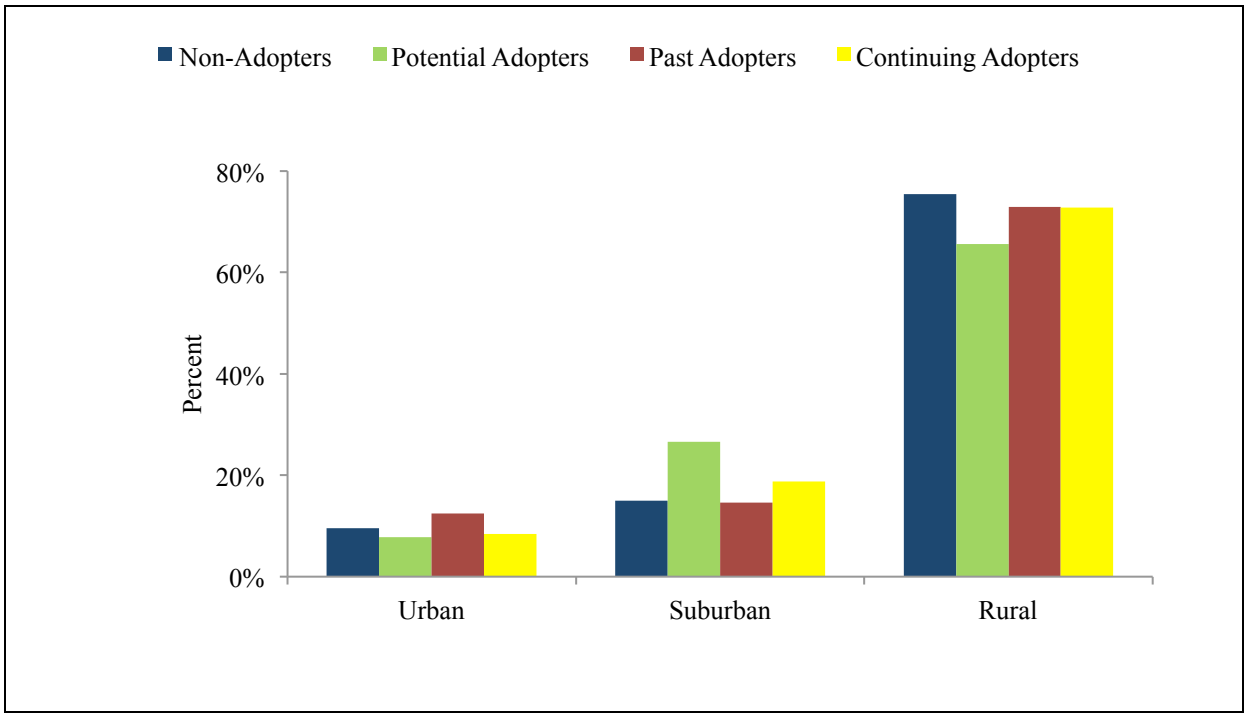
The proportion of land in mature forest also differed by patch cut adopter type (Figure 22). Past adopters and continuing adopters had the most mature forest on their property (50% of their land on average) with non-adopters having the least mature forest (38%). The amount of young forest on their property did not differ across types.

Figure 19. Mean total acres owned by patch cut adopter types.



Means that do not share subscripts differ at $p < .05$ in the Dunnett's T3 ANOVA post-hoc comparison.

Figure 20. Place of primary residence by patch cut adopter types.



Statistically significant according to Pearson Chi-square, p <. 05. Statistically significant difference in distribution of residence by patch cut adopter types according to Pearson Chi-square, p <. 05.

Figure 21. Level of education by patch cut adopter type.

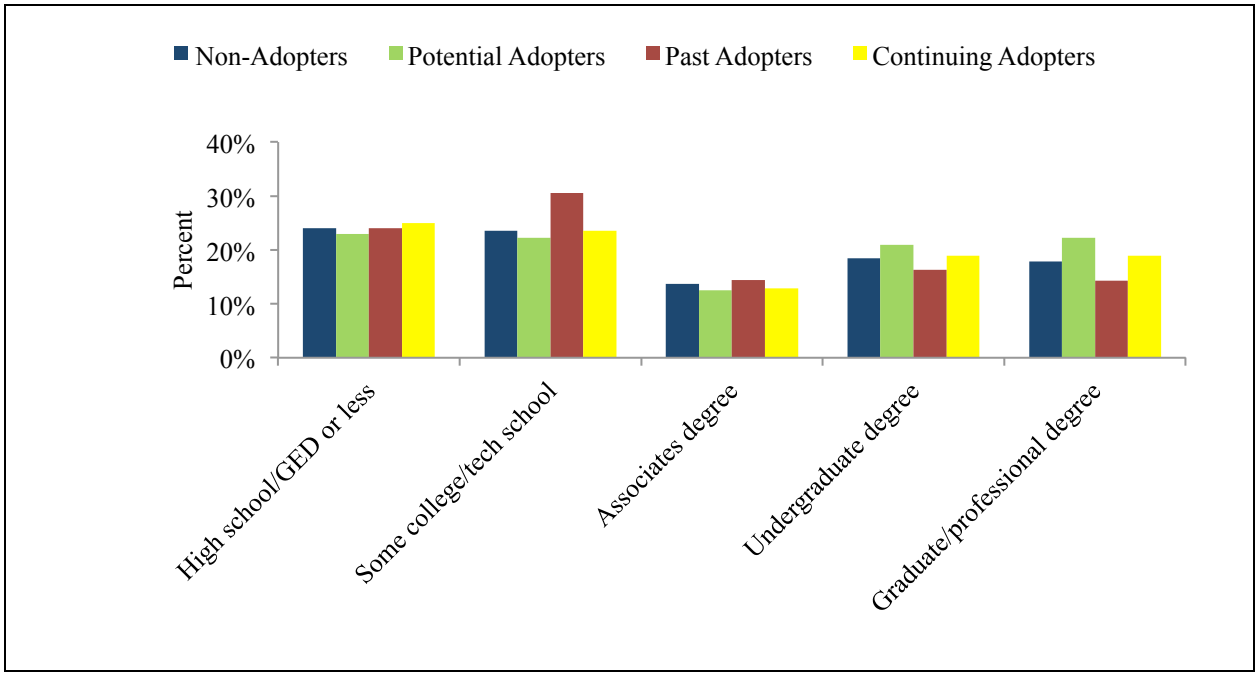
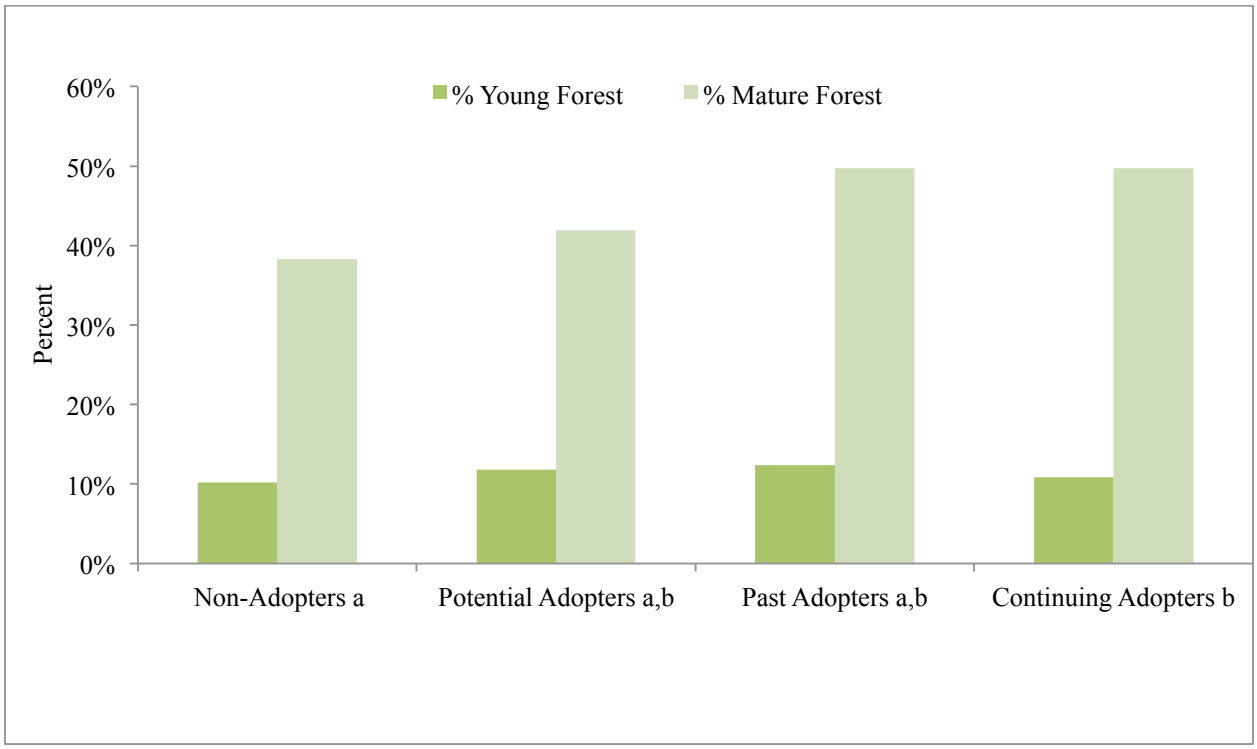


Figure 22. Forest land composition (percent of total land) by patch cut adopter types.



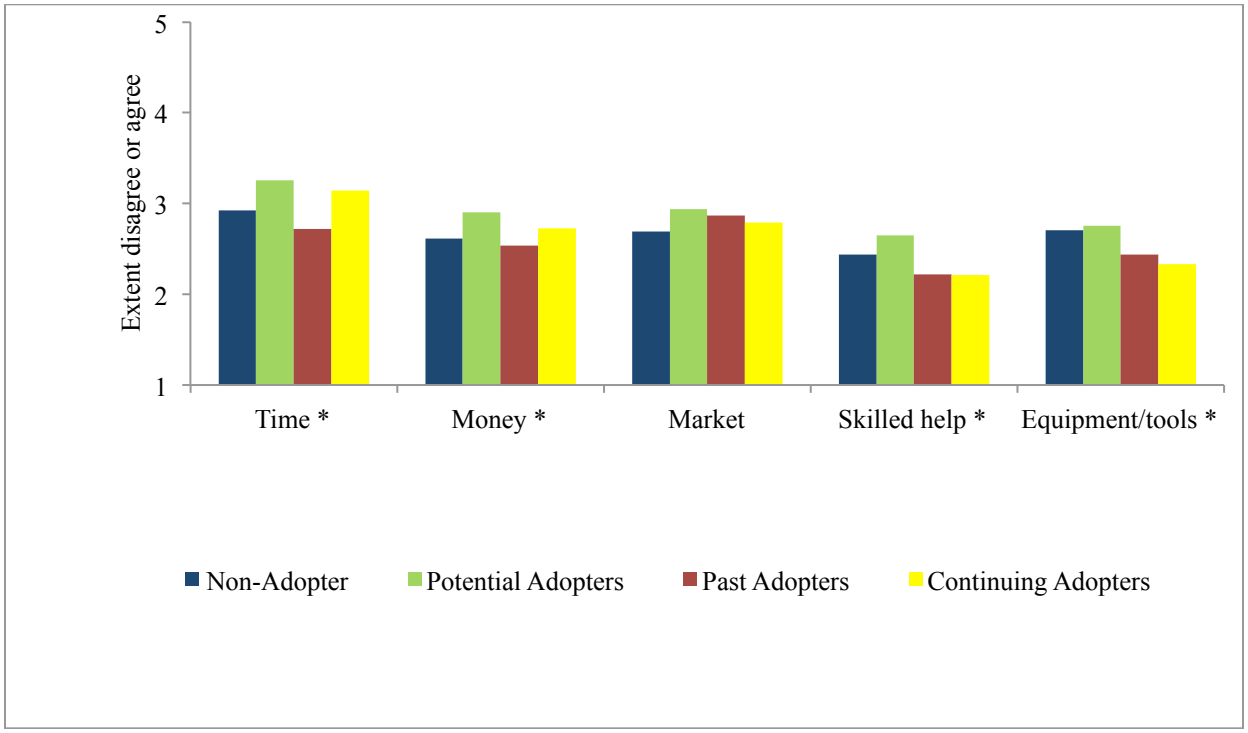
For mature forest, means that do not share subscripts differ at $p < .05$ in the Dunnett's T3 ANOVA post-hoc comparison. There was no statistically significant differences for young forest.

Cutting on Private Land: Barriers, Incentives, and Information Sources by Adopter Types

Perceived barriers to cutting differed by adopter type (Figures 23 and 24). Time and money were more of an issue for potential and continuing adopters than it was for other 3 types. Finding a market for products from cutting was slightly more of an issue for potential adopters, as was a lack of skilled help. Lastly, equipment and tools were more of an issue for potential and non-adopters than the others. Similarly, a lack of knowledge and support was more of an issue for potential adopters and, to a lesser degree, non-adopters than the other types. In contrast, non-adopters were more likely to be fundamentally opposed, rather than experiencing constraints, believing that cutting is not the right thing to do or they do not like the look of it.

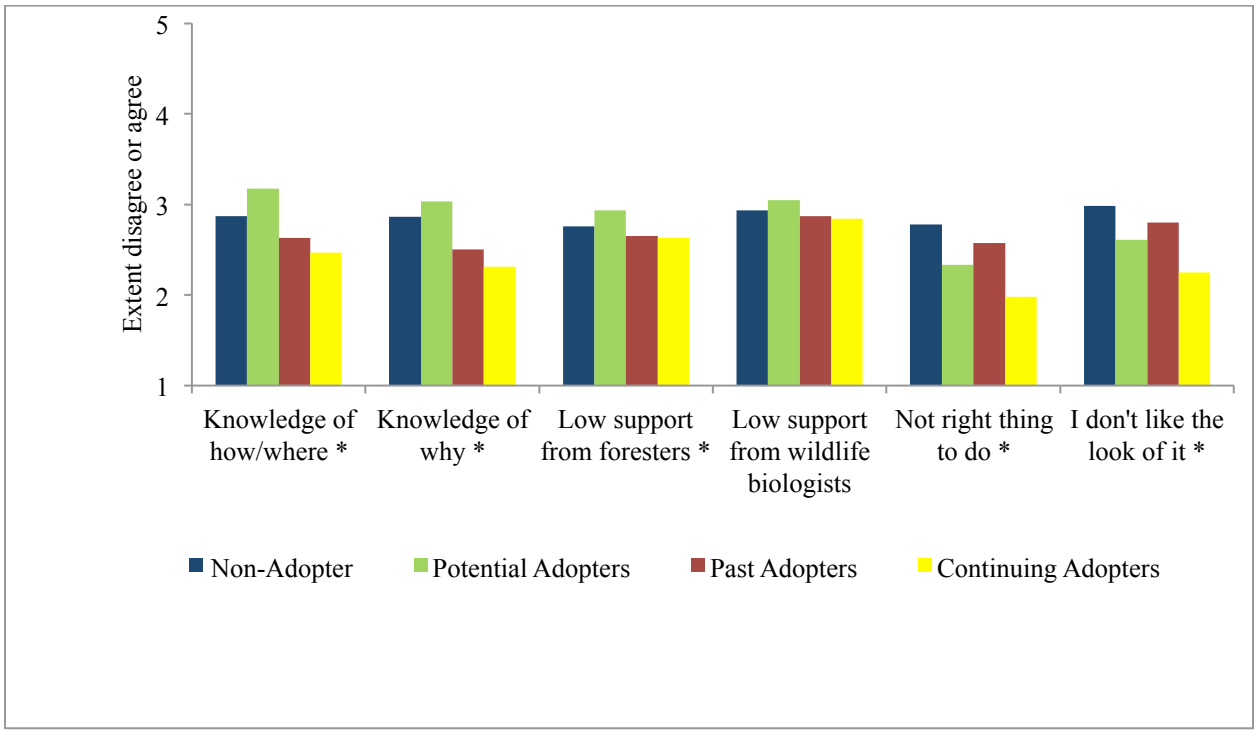
All of the influences on patch cutting behavior had more impact on the willingness of potential and continuing adopters than the other types (Figure 25). Yet, the patch cut adopter types all followed the same pattern for which factors would most increase their willingness: those related to knowledge and advice (i.e., advice from an expert, plan calling for activity, learning the activity benefits wildlife or rare wildlife) were most influential, those related to financial and physical (i.e., financial assistance or tax reduction, borrowing equipment, receiving labor) were the next most influential, and the social approaches (found more people doing it, found less people doing it, earning recognition) were least influential.

Figure 23. Landowners' perceived limits to cutting* items related to financial or physical resources by patch cut adopter type.



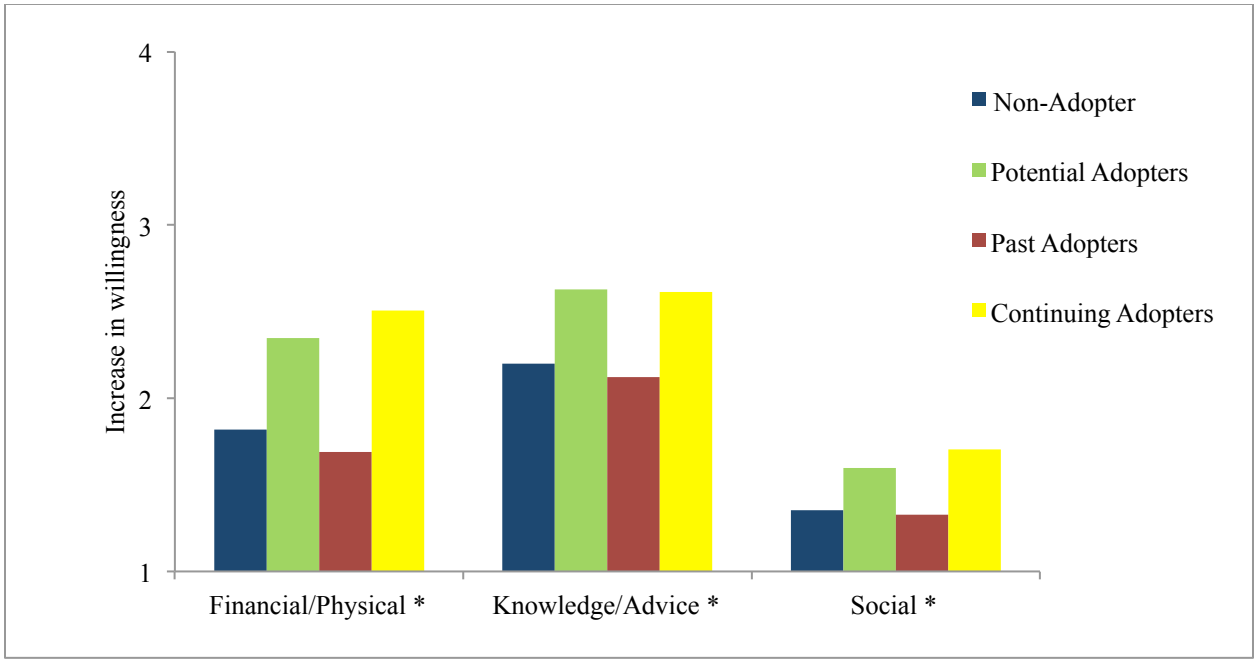
For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree
*Statistically significant differences between adopter types at p <. 05.

Figure 24. Landowners' perceived limits to cutting items related to knowledge, support, and aesthetics by patch cut adopter type.



For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree
*Statistically significant differences between adopter types at p <. 05.

Figure 25. Influences on increasing landowner willingness to cut by patch cut adopter types.

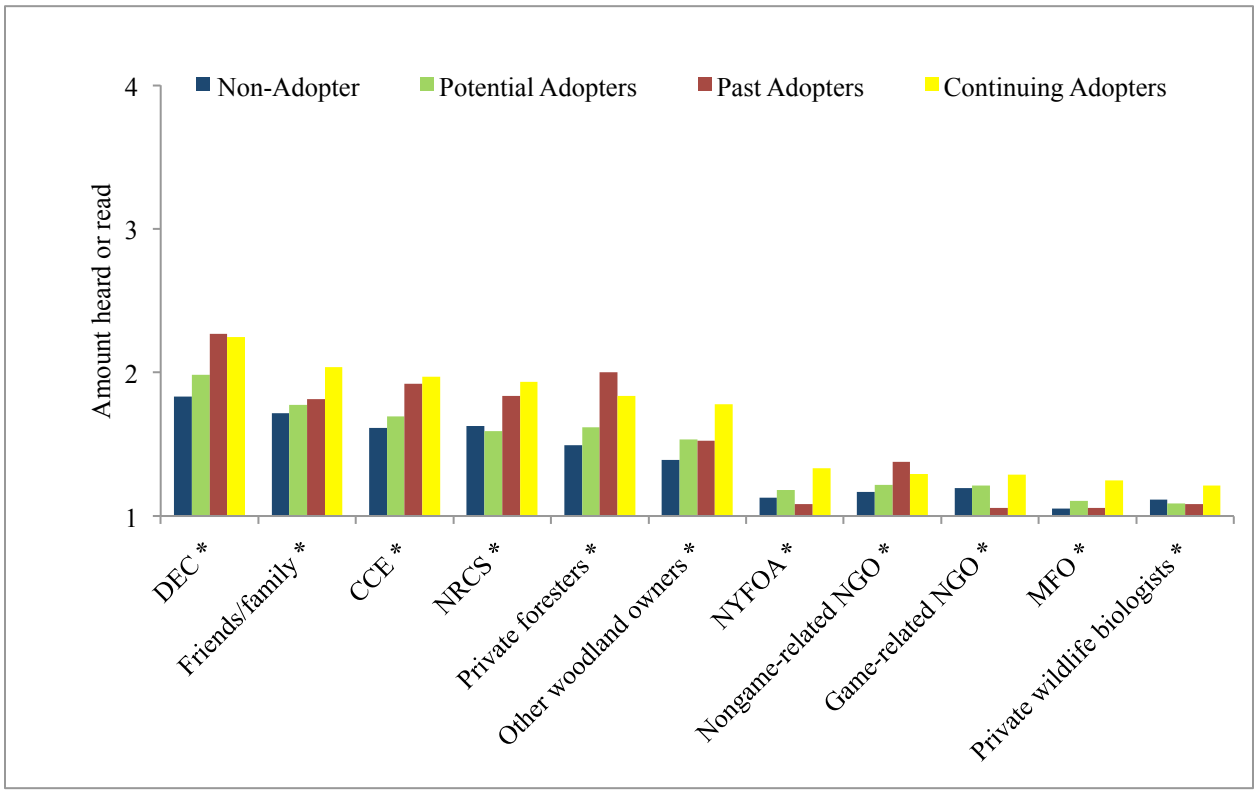


For mean calculations, items coded as 1=Not increase, 2=Slightly increase, 3=Moderately increase, 4=Greatly increase
*Statistically significant differences between adopter types at p <. 05.

Information Sources for Patch Cut Adopter Types.

The patch cut adopter types varied in their exposure to information sources (Figure 26), with continuing adopters having more exposure to all sources than non or potential adopters. Additionally, past adopters had higher levels of exposure to some of the more common sources, than did non-adopters and potential adopters: NYSDEC, NRCS, CCE (Cornell Cooperative Extension), and private foresters.

Figure 26. Landowner exposure to information sources by patch cut adopter types.



For mean calculations, items coded as 1=None, 2=A little, 3=Some, 4=A lot
*Statistically significant differences between adopter types at p <. 05.

Summary

One third of the sample (n = 343) owned 10-49 acres in the Southern Tier, while two-thirds (n = 686) owned 50 acres or more. Small landowners owned fewer parcels, had not lived on their land as long, and were less likely to live on their land than were large landowners. Large landowners were more likely to belong to wildlife and/or land conservation organizations. Landowners' properties were characterized by primarily mature forest (about 40% for both size landowners), followed by agricultural land and young forest. While the majority of landowners indicated they would like the composition of their land cover to stay the same, if they wished for change in land cover composition in the future, they tended to desire more mature forest, young forest and agricultural land and less shrubland and fallow field (early stage precursors of ESH). Generally, landowners had more positive attitudes toward mature forest than any other land type. Providing wildlife habitat and protecting nature was very important to many landowners. Large

landowners were more motivated by hunting and fishing, farming, and timber than were small landowners.

Far more landowners (70% of small landowners; 80% of large landowners) had cut single trees throughout their woods (which does not tend to create ESH) than had cut patches of trees (which tends to create ESH). Fewer small landowners (21%) than large landowners (35%) had cut patches. Their intentions for future cutting followed this pattern as well, with more landowners intending to cut single trees throughout their woods than patch cut and large landowners expressing greater likelihood to do both types of cutting than small landowners.

These behavioral intentions closely track landowners' attitudes. More landowners believed that cutting single trees scattered throughout their land is better for their land and wildlife than cutting patches of trees. Large landowners were slightly more positive about both types of cutting than were small landowners.

Overall, landowners encountered few barriers to cutting trees on their land. Among those articulating barriers, lack of time was the most common. Small landowners did perceive the limitations for their cutting to be somewhat greater than did large landowners, especially lack of acreage, knowledge, support from foresters, and thinking it is the right thing to do. Yet, on average, all of these barriers fell between "neutral" and "disagree." The factors that would be most effective for influencing landowner willingness to cut patches include learning that patch cutting benefits wildlife or rare wildlife or receiving financial assistance or tax reduction (suggesting a role for education and outreach programs as well as policy initiatives or incentive programs that might enhance patch cutting related behavior). Large landowners were slightly more influenced by financial/tax assistance and finding a market than were small landowners. The information sources that landowners currently have the most contact with are the NYSDEC, and friends and family. Yet, no information source currently appears to influence many landowners. Small landowners have even less exposure to or influence from wildlife and land management information than do large landowners.

Landowners were segmented into four types of patch cutters based on past behavior and future intended behavior: non-adopters, potential adopters, past adopters, and continuing adopters. Large landowners were more likely to be continuing adopters than were small landowners; and the reverse was the case for potential adopters. The types differed on some key landowner characteristics: continuing adopters owned more land, and potential adopters were more likely to be suburban residents and have a higher level of education than other types of landowners. Continuing adopters and past adopters had the greatest percentage of their land in mature forest, suggesting a connection between abundant mature forest and behavior tied to the creation of ESH. The types did not differ, however, on the percentage of their land in young forest.

The perceived barriers to cutting differed across types of landowners. Time and money were greater issues for potential and continuing adopters. Finding a market for products from cutting, skilled help, knowledge, and support were all greater issues for potential adopters than the other types. Non-adopters were more likely to believe that cutting was not the right thing to do and they did not like the look of it, suggesting fundamental opposition and hence, a more limited role for incentives, assistance, etc. Study results show that for potential adopters, programs that

provide knowledge and advice or address basic needs (such as financial and equipment) would have the greatest influence on their likelihood to manage their lands for ESH. Landowner programs that address basic needs, knowledge, and advice will have a similarly great impact on continuing adopters but likely to a lesser degree than the other types.

CONCLUSIONS AND RECOMMENDATIONS

The findings of this study can be used to inform programs focused on the decisions of private landowners to undertake ESH management. Natural resource professionals in New York and the Northeast confirmed an important need for research examining human dimensions issues such as landowner knowledge, attitudes and perceived barriers to ESH management. Experts who currently work on ESH conservation—and with forest landowners more generally—believed that the greatest challenge to ESH conservation was landowner knowledge and attitudes about ESH and suggested human dimensions research could provide insights into landowner attitudes and how to conduct education and outreach given these attitudes.

In exploring the state of knowledge and outreach related to ESH among experts, we found some additional challenges aside from landowner knowledge and attitudes. We learned that even experts find it difficult to define ESH. Also, experts found the optimal characteristics for wildlife challenging to identify because they vary by species of interest. This definitional lack of clarity may impede the systematic achievement of ESH-related goals and objectives, or at least require greater clarification in their articulation. Experts largely think of ESH as part of an ecological process that can be successfully created through well-established land management techniques, primarily clearcutting or cutting patches. This view of ESH as part of an ongoing ecological process and the emphasis on cutting for establishing and maintaining ESH is not as prevalent among landowners – even those currently managing for ESH. More of the landowners that we talked to than experts think of reverting fields (a passive creation technique for ESH that may be less effecting than patch cutting in creating ESH) when referring to ESH. Site visits with landowners revealed that those who believe they are creating ESH vary greatly in the extent to which they are actually doing so. While cutting is their primary activity to create ESH, most of the cutting done by landowners to create ESH is actually thinning and not the even-aged silvicultural techniques of patch or clearcutting needed to effectively create ESH. Further, some landowners are not cutting but somehow—perhaps tied to the reverting field strategy noted above—believe their activities will create ESH. This disconnect between landowners and experts and what management activities landowners believe create ESH will likely need to be considered in outreach and incentive program development.

Interviews with landowners conducting ESH management also offered insights into factors motivating their behavior and ways agencies and organizations might further support them. Landowners are undertaking ESH management tended to be interested in creating wildlife diversity and habitat on their property, and many do this, at least in part, to increase the population of game species of interest. Landowners believe they could be best assisted by agencies and organizations through outreach/education and financial assistance. This aligns with how experts believe they can support the activities of landowners as well.

Results from our quantitative mail survey suggest both small and large landowners had more positive attitudes toward mature forest than toward other land types (including ESH types of

young forest, shrublands, etc.). They tended to be satisfied with the amount of mature forest, young forest, and shrublands currently on their land. Those who wanted change preferred more mature and young forest and less shrublands, indicating some resistance to increasing the amount of the earlier stage of ESH on their land relative to other types of land cover. Landowners' experience and future interest in cutting activities followed this same trend. Many more landowners had cut single trees throughout their property (which does not tend to create ESH) then had cut patches of trees (which tends to create ESH). Their intentions for future cutting followed the pattern of past cutting, with landowners indicating a much higher likelihood to cut single trees throughout their property in the next five years than patches of trees. Thus, for the majority of landowners, future management activities are not currently focused on even-aged harvesting treatments that would create forest openings for ESH.

These cutting behaviors are consistent with landowners' attitudes about cutting. More landowners believed that cutting single trees scattered throughout their land is better for their land and wildlife than is cutting a patch of trees. Thereby, we found that landowners have relatively less interest in ESH than other habitat types, are less likely to cut patches than they are to cut single trees, and a likely rationale through their attitudes that this behavior (even-aged management) is not neither good for their land nor wildlife. The experts' perception that landowners' knowledge and attitudes are a challenge to ESH management on private lands appears to be confirmed with these findings.

Landowners perceived few constraints to cutting (in general) on their land, with time being the most often invoked barrier. Yet, many landowners indicated that education about the benefit of patch cutting to wildlife would increase their likelihood to cut patches of trees on their land as would receiving financial assistance or tax reduction. These results corroborated what we found in the landowner interviews, indicating that landowners considering even-aged management activities would benefit from a paired communications emphasis on the benefits of this type of management to wildlife and provision of financial support.

Such support and education might be delivered through the information sources with which landowners currently have the most contact: the NYSDEC and friends and family. However, none of the current information sources has a particularly strong influence on landowners' beliefs, thus it is advisable to consider how sources of information might be more effective. From past research, we know that landowners are most receptive to information and messages from trusted sources and the trusted source varies by landowner. Thus, a coordinated effort among multiple organizations and agencies will be needed to reach a breadth of landowners.

Overall, we did not find strong differences between small and large landowners. Although large landowners had a larger proportion of their land in agriculture and were slightly more likely to own their land for reasons of hunting and fishing, timber products, and farming, their most important motivations, such as wildlife habitat, were similar to those of small landowners. However, large landowners were less constrained in their ability to cut. They had somewhat more experience with both types of cutting and more willingness to cut in the future. They also reported they would be slightly more influenced by financial/tax assistance and markets in cutting patches on their land (although increasing their knowledge about the benefits of cutting for wildlife was most important for both large and small landowners). Large landowners

reported hearing or reading slightly more from many of the information sources than did small landowners. Not only does this information better reach large landowners, it had more influence on them than on small landowners. Thereby, while large landowners may be easier to reach and more likely to conduct ESH management, with the trend of increasing parcelization and smaller landowners, attention to improving mechanisms to reach out to small landowners may be advisable.

The typology of patch cut adopters developed from the survey results offers additional insights for education and outreach. Potential adopters are the most receptive group for information about ESH; past and non-adopters are unlikely to undertake the behavior, even with concerted education and incentive efforts. Continuing adopters are already undertaking the behavior and will likely continue; thus, outreach could potentially reinforce their behavior or expand the extent of the practice. However, outreach efforts that focus on this group may only result in marginal increases, as is often the case when "preaching to the choir." Yet, for programs seeking to increase ESH, continuing adopters could be cultivated as ambassadors for ESH conservation among their fellow landowners.

Potential adopters tended to have a higher level of education. Time and money were a greater issue for them than past and non-adopters. Finding a market for forest products, skilled help conducting management, knowledge about wildlife benefits from cutting, and professionals' support were all greater issues for potential adopters than all of the other types. To reach potential adopters, outreach programs that provide knowledge and advice or address basic needs (such as financial and equipment) will likely have the greatest impact.

In summary, these results highlight that significant conservation of ESH on private lands requires coordinated and strategic efforts to reach out to landowners and highlight the benefits of ESH. Currently, the majority of landowners do not show a propensity for ESH (particularly the shrublands element of ESH, as opposed to young forest) or the primary cutting approach that creates it (even-aged management). Yet, landowners are not resistant to cutting in general and report few barriers to doing so. The issue is that they largely believe that cutting single trees scattered throughout their property is better for their land and for wildlife than is cutting patches of trees. In this vein, many landowners indicate that if they learned cutting patches of trees benefited wildlife they would be more likely to do so. Additionally, financial support appears to be another means by which to encourage some landowners to cut patches of trees to create ESH. A segment of landowners who we describe as potential adopters could be most interested in messages and management activities related to ESH.

Recommendations to Support Landowners Interested in ESH Management

Policymakers, private lands wildlife biologists, educators, and private lands foresters all have key roles in supporting landowners' interest in ESH management. Based on our research findings, we provide recommendations for each of these groups.

For agency leadership and policymakers:

1. Recognize and build on the strong importance of wildlife and wildlife habitat to private landowners, which is in line with NYS DEC goals of enhanced wildlife habitat on private lands.
2. Given that lack of supportive regulation was the third greatest barrier to landowners and recognizing the connection between wildlife habitat outcomes and the forest management practices that create them, resist policies that restrict sustainable forest management practices that benefit wildlife.
3. Where possible, provide funding to educational and outreach programs for landowners interested in learning more about managing their lands for wildlife (e.g., private lands wildlife biologists or extension or ESH species-specific initiatives). These programs could cover information on ESH, associated wildlife, and how patch cutting activities benefit wildlife.
4. Explore the potential to adjust existing programs for tax reductions for forest management (e.g., 480A) to include activities that create ESH and support wildlife.
5. Provide funding to financial assistance and incentive programs that aid landowners in ESH management.
6. Given the general lack of awareness of the linkages between forest cutting practices, ESH, and wildlife outcomes, develop demonstration sites on public and other types lands to show examples of appropriate management for ESH and the benefits to wildlife.

For private lands wildlife biologists:

1. For those organizations who consider ESH on private lands important, biologists may help communicate ESH benefits for wildlife when working with landowners. Become familiar with ESH conservation needs, species, and management activities to support landowners with goals of sustaining wildlife diversity and creating wildlife habitat.
2. Recognize and build on the strong importance of wildlife and wildlife habitat to private landowners. Most landowner interests in wildlife may also be associated with hunting and/or wildlife watching, influencing which ESH species may be most of interest to them. Prepare communications with landowners accordingly about what *specific* wildlife species (game and non-game) interest them and ways to jointly achieve sustainable timber management for ESH and wildlife goals.
3. Come to a shared understanding, among professionals, of how ESH management prescriptions vary depending on wildlife species of interest. Be able to communicate these needs and how to best accomplish them on a private landowners' property.

4. Utilize educational tools and materials that support landowners interested in ESH – available from Cornell Cooperative Extension, Natural Resource Conservation Service, and many wildlife conservation NGOs.
5. Provide on-the-ground advice to landowners considering cutting patches of trees for ESH as to how and where to effectively manage for ESH, given that not every property is appropriate for ESH management. Build/maintain relationships with foresters who work with private landowners as they have connections with many landowners who may be interested in ESH and associated wildlife on their lands.

For educators and outreach specialists:

1. Recognize and build on the strong importance of wildlife and wildlife habitat to private landowners. Develop a multi-faceted range of educational materials for landowners on ESH benefits for wildlife, showing wildlife that landowners are interested in managing for and that utilize ESH. Connect landowners with financial and technical assistance programs to aid in habitat management. Distribute materials through NYSDEC, foresters, wildlife biologists, Cooperative Extension, and trained volunteers.
2. Focus on "potential adopters" with educational programs related to ESH conservation, the required management activities, finding markets for such activities, and how to take advantage of programs for financial assistance and other support.
3. Consider in messaging that landowners currently have less interest in shrublands on their property than young forest and mature forest.
4. Cultivate "continuing adopters" as ambassadors to share their experiences about the benefits of ESH to wildlife—given the reliance of landowners on friends and family as an information source about management. In some areas, landowner associations and trained landowner volunteers may provide a venue to share information about ESH and other wildlife habitat conservation needs.
5. Provide training that helps foresters and loggers better incorporate management for ESH into their practices and planning for those landowners interested in such wildlife species. To minimize the ecological challenges cited in our expert interviews, include information on how characteristics of a landowner's property (where it is in the state, surrounding land uses and habitat types, soil types, slope, amount of invasive species, deer pressure) might make ESH more or less advisable on a property.
6. Utilize educational tools and materials about programs that support landowners interested in ESH –available from Cornell Cooperative Extension, Natural Resource Conservation Service, and many wildlife conservation NGOs. Many of these resources are catalogued at www.landownerhabitatdecisions.org.

For private lands foresters:

1. Recognize and build on the strong importance of wildlife and wildlife habitat to private landowners. Recognize the crucial value of wildlife to many private forest landowners. Become familiar with ESH conservation needs, species, and management activities to support landowners who seek to sustain wildlife diversity, and create wildlife habitat for game and non-game species. Foresters should realize that more landowners are

interested in these activities than interested in owning land for financial gain from timber products.

2. Utilize educational tools and promotional materials about programs that support landowners interested in ESH –available from Cornell Cooperative Extension, Natural Resource Conservation Service, and many wildlife conservation NGOs. Many of these resources are catalogued at www.landownerhabitatdecisions.org.
3. Learn what existing and emerging markets can be linked to landowners interested in ESH management through clearcutting or cutting patches to ensure it is financially feasible.
4. Develop marketing strategies that utilize the desired sources of information on wildlife benefits from cutting activities. For example, have copies of brochures to share with clients.
5. To minimize the ecological challenges cited in our expert interviews, be aware of how characteristics of a landowner's property (where it is in the state, surrounding land uses and habitat types, soil types, slope, amount of invasive species, deer pressure) might make ESH more or less advisable on a property.
6. Build relationships with wildlife biologists and wildlife conservation organizations to stay well-informed about the large proportion of landowners with such goals for their property.

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APPENDIX A. ADDITIONAL TABLES OF LANDOWNER SURVEY RESULTS

1. **What are the characteristics of the parcel(s) of land you own in the Southern Tier of New York State?** The Southern Tier includes Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Cortland, Tioga, Broome, Chenango, Otsego, and Delaware counties. *(Complete one row for each parcel of land you own.)*

Small (10-49 acres) Landowner Responses

Parcel in Southern Tier	How many acres?	How many years owned?	How far do you live (miles) from the parcel?
1	*n=343, M=22.18, Mdn=20*	*n=340, M=19.75, Mdn=18*	*n=335, M=73.85, Mdn=0*
2	*n=57, M=16.04, Mdn=14*	*n=55, M=15.49, Mdn=13*	*n=54, M=49.43, Mdn=1*
3	*n=14, M=16.86, Mdn=15*	*n=14, M=16.86, Mdn=15*	*n=13, M=14.08, M=5*
4	*n=5, M=6.20, Mdn=2*	*n=5, M=16.40, Mdn=12*	*n=5, M=23.40, Mdn=12*
5	*n=0, M= -, Mdn=-*	*n=0, M=-, Mdn=-*	*n=0, M=-, Mdn=-*

Large (50 or more acres) Landowner Responses

Parcel in Southern Tier	How many acres?	How many years owned?	How far do you live (miles) from the parcel?
1	*n=686, M=125.81, Mdn=91*	*n=655, M=26.09, Mdn=23*	*n=668, M=65.69, Mdn=0*
2	*n=275, M=76.96, Mdn=50*	*n=263, M=22.42, Mdn=18*	*n=269, M=49.45, Mdn=1*
3	*n=132, M=51.99, Mdn=30*	*n=128, M=20.83, Mdn=15*	*n=127, M=40.76, M=1*
4	*n=59, M=57.75, Mdn=55*	*n=58, M=19.40, Mdn=15*	*n=58, M=54.02, Mdn=1.5*
5	*n=29, M=54.38, Mdn=35*	*n=29, M=18.24, Mdn=16*	*n=29, M=95.41, Mdn=3*

2. **About how many acres of each of the following types of land do you own <u>in the Southern Tier</u>?** (*Note: a picture of the land types is below.*) *n=1033*

Small (10-49 acres) Landowner Responses

Land types	**About how many acres owned?** *(write a number in each box)*
Residential (lawn, gardens, buildings, paved) *n=343*	*M=2.31, Mdn=2.00*
Agricultural (crop fields, Christmas trees, hay fields mowed more than once annually) *n=343*	*M=3.87, Mdn=0*
Grassland or field regularly mowed every 1-3 years *n=343*	*M=2.02, Mdn=0.0*
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=342*	*M=1.81, Mdn=0.0*
Shrubland (more than 25% brush) *n=340*	*M=2.72, Mdn=0.0*
Young forest (most trees with trunks less than 4" in diameter) *n=336*	*M=3.37, Mdn=0.0*
Mature forest *n=336*	*M=9.94, Mdn=8.00*
Other (please specify) _____ *n=*	*M=, Mdn=*

Large (50 or more acres) Landowner Responses

Land types	**About how many acres owned?** *(write a number in each box)*
Residential (lawn, gardens, buildings, paved) *n=684*	*M=4.10, Mdn=2*
Agricultural (crop fields, Christmas trees, hay fields mowed more than once annually) *n=684*	*M=45.24, Mdn=15*
Grassland or field regularly mowed every 1-3 years *n=684*	*M=14.0, Mdn=2.0*
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=681*	*M=10.23, Mdn=0.0*
Shrubland (more than 25% brush) *n=681*	*M=12.9, Mdn=0.0*
Young forest (most trees with trunks less than 4" in diameter) *n=674*	*M=13.46, Mdn=5.0*
Mature forest *n=677*	*M=65.91, Mdn=44.0*
Other (please specify) _____ *n=*	*M=, Mdn=*

3. **How would you like your land to change in the future?** Refer back to Question 2 to compare what you want in the future with the amount you currently have. *(Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Land types	**Compared to now, I'd like my land to have…**
Residential (lawn, gardens, buildings, paved) *n=277, M=1.98*	□Less 29 (10.5%) □Same **225 (81.2%)** □More 23 (8.37%)
Agricultural (crop fields, Christmas trees, hay fields mowed more than once annually) *n=231, M=2.19*	□Less 16 (6.9%) □Same **156(67.5%)** □More 59 (25.5%)
Grassland or field regularly mowed every 1-3 years *n=221, M=2.05*	□Less 25 (11.3%) □Same **161(72.9%)** □More 35 (15.8%)
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=210, M=1.89*	□Less 45 (21.4%) □Same **143 (68.1%)** □More 18 (7.9%)
Shrubland (more than 25% brush) *n=228, M=1.78*	□Less 69 (30.3%) □Same **141 (61.8%)** □More 18 (7.9%)
Young forest (most trees with trunks less than 4" in diameter) *n=237, M=2.14*	□Less 41 (17.3%) □Same 122 **(51.5%)** □More 74 (31.2%)
Mature forest *n=277, M=2.26*	□Less 20 (7.2%) □Same **165 (59.6%)** □More 92 (33.2%)
Other (please specify) _____ *n=12, M=2.17*	□Less 2 (16.7%) □Same **6 (50.0%)** □More 4 (33.3%)

Large (50 or more acres) Landowner Responses

Land types	**Compared to now, I'd like my land to have…**
Residential (lawn, gardens, buildings, paved) *n=595, M=1.97*	□Less 43 (7.2%) □Same **526 (88.4%)** □More 26 (4.4%)
Agricultural (crop fields, Christmas trees, hay fields mowed more than once annually) *n=589, M=2.28*	□Less 18 (3.1%) □Same **387 (65.7%)** □More 184 (31.2%)
Grassland or field regularly mowed every 1-3 years *n=543, M=2.10*	□Less 60 (11.0%) □Same **371(68.3%)** □More 112 (20.6%)
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=521, M=1.81*	□Less 145(21.1%) □Same **332 (48.4%)** □More 44 (6.4%)
Shrubland (more than 25% brush) *n=541, M=1.72*	□Less 191 (35.5%) □Same **311 (57.5%)** □More 39 (7.2%)
Young forest (most trees with trunks less than 4" in diameter) *n=558, M=2.12*	□Less 97 (17.4%) □Same **297 (53.2%)** □More 164 (29.4%)
Mature forest *n=633, M=2.34*	□Less 30 (4.4%) □Same **360 (56.9%)** □More 243 (38.4%)
Other (please specify) _____ *n=44, M=2.39*	□Less 4 (9.1%) □Same 19 (43.2%) □More **21 (47.7%)**

4. **Would you say your general attitude toward each of these land types is positive, negative, or neutral?** *(Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Activities	Very Negative	Negative	Neither	Positive	Very Positive
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=297, M=3.35*	9 (3.0%)	35 (11.8%)	**129 (43.4%)**	91 (30.6%)	33 (11.1%)
Shrubland (more than 25% brush) *n=296, M=3.32*	9 (3.0%)	51 (17.2%)	**106 (35.8%)**	95 (32.1%)	35 (11.8%)
Young forest (most trees with trunks less than 4" in diameter) *n=295, M=3.89*	4 (1.4%)	15 (5.1%)	57 (19.3%)	**153 (51.9%)**	66 (22.4%)
Mature forest *n=308, M=4.28*	1 (0.3%)	6 (1.9%)	40 (13.0%)	121 (39.3%)	**140 (45.5%)**

For mean calculations, items coded as 1=Very Negative, 2=Negative, 3=Neither, 4=Positive, 5=Very Positive

Large (50 or more acres) Landowner Responses

Activities	Very Negative	Negative	Neither	Positive	Very Positive
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=629, M=3.14*	34 (5.4%)	129 (20.5%)	**232 (36.9%)**	183 (29.1%)	5 (8.1%)
Shrubland (more than 25% brush) *n=625, M=3.16*	37 (5.9%)	129 (20.6%)	**204 (32.6%)**	207 (33.1%)	48 (7.7%)
Young forest (most trees with trunks less than 4" in diameter) *n=620, M=3.79*	7 (1.1%)	2 (3.7%)	160 (25.8%)	**331 (53.4%)**	99 (16.0%)
Mature forest *n=656, M=4.27*	5 (0.8%)	6 (0.9%)	85 (13.0%)	269 (41.0%)	**291 (44.4%)**

For mean calculations, items coded as 1=Very Negative, 2=Negative, 3=Neither, 4=Positive, 5=Very Positive

5. **How necessary or unnecessary do you believe the following types of land are for wildlife conservation?** *(Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Activities	Very Un-necessary	Un-necessary	Neither	Necessary	Very Necessary
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=310, M=3.96*	8 (2.6%)	16 (5.2%)	42 (13.5%)	**158 (51.0%)**	86 (27.7%)
Shrubland (more than 25% brush) *n=314, M=4.10*	7 (2.2%)	13 (4.1%)	25 (8.0%)	**166 (52.9%)**	103 (32.8%)
Young forest (most trees with trunks less than 4" in diameter) *n=313, M=4.18*	8 (2.6%)	4 (1.3%)	24 (7.7%)	**165 (52.7%)**	112 (35.8%)
Mature forest *n=316, M=4.32*	10 (3.2%)	3 (0.9%)	16 (5.1%)	135 (42.7%)	**152 (48.1%)**

For mean calculations, items coded as 1=Very Unnecessary, 2=Unnecessary, 3=Neither, 4=Necessary, 5=Very Necessary

Large (50 or more acres) Landowner Responses

Activities	Very Un-necessary	Un-necessary	Neither	Necessary	Very Necessary
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush) *n=653, M=3.86*	29 (4.4%)	51 (7.8%)	53 (8.1%)	**370 (56.7%)**	150 (23.0%)
Shrubland (more than 25% brush) *n=641, M=4.06*	18 (2.8%)	32 (5.0%)	38 (5.9%)	**358 (55.9%)**	195 (30.4%)
Young forest (most trees with trunks less than 4" in diameter) *n=636, M=4.07*	15 (2.4%)	18 (2.8%)	45 (7.1%)	**386 (60.7%)**	172 (27.0%)
Mature forest *n=657, M=4.23*	14 (2.1%)	15 (2.3%)	43 (6.5%)	**319 (48.6%)**	266 (40.5%)

For mean calculations, items coded as 1=Very Unnecessary, 2=Unnecessary, 3=Neither, 4=Necessary, 5=Very Necessary

6. **To what extent do you agree or disagree with each of the following statements about your land?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Thoughts about your land	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
It is my favorite place to be. *n=326, M=4.28*	3 (0.9%)	7 (2.1%)	46 (14.1%)	109 (33.4%)	**161 (49.4%)**
For the things I enjoy most, no other place can compare. *n=322, M=3.89*	4 (1.2%)	29 (9.0%)	59 (18.3%)	**136 (42.2%)**	94 (29.2%)
Everything about it is a reflection of me. *n=319, M=3.77*	4 (1.3%)	22 (6.9%)	92 (28.8%)	**127 (39.8%)**	74 (23.2%)
I feel happiest when I am there. *n=319, M=4.05*	3 (0.9%)	12 (3.8%)	54 (16.9%)	**146 (45.8%)**	104 (32.6%)
It is the best place to do the things I enjoy. *n=321, M=3.99*	2 (0.6%)	16 (5.0%)	63 (19.6%)	**143 (44.5%)**	97 (30.2%)
I feel that I can really be myself there. *n=322, M=4.21*	3 (0.9%)	3 (0.9%)	38 (11.8%)	**156 (48.4%)**	122 (37.9%)

For mean calculations, items coded as 1=Strongly Disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strong Agree

Large (50 or more acres) Landowner Responses

Thoughts about your land	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
It is my favorite place to be. *n=664, M=4.44*	3 (0.5%)	12 (1.8%)	54 (8.1%)	216 (32.5%)	**379 (57.1%)**
For the things I enjoy most, no other place can compare. *n=656, M=4.12*	6 (0.9%)	34 (5.2%)	110 (16.8%)	229 (34.9%)	**277 (42.2%)**
Everything about it is a reflection of me. *n=655, M=3.90*	9 (1.4%)	39 (6.0%)	147 (22.4%)	**273 (41.7%)**	187 (28.5%)
I feel happiest when I am there. *n=657 M=4.23*	4 (0.6%)	17 (2.6%)	88 (13.4%)	265 (40.3%)	**283 (43.1%)**
It is the best place to do the things I enjoy. *n=660, M=4.19*	5 (0.8%)	25 (3.8%)	78 (11.8%)	**285 (43.2%)**	267 (40.5%)
I feel that I can really be myself there. *n=662, M=4.28*	5 (0.8%)	10 (1.5%)	76 (11.5%)	**274 (41.4%)**	297 (44.9%)

For mean calculations, items coded as 1=Strongly Disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strong Agree

7. **People own land for many reasons. How important are the following as reasons for why you own your land in the Southern Tier?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Reasons you own your land	Not at all important	Slightly important	Moderately important	Very important
To enjoy the scenery *n=325, M=3.48*	5 (1.5%)	25 (7.7%)	103 (31.9%)	**190 (58.8%)**
To protect nature *n=325, M=3.29*	12 (3.7%)	42 (12.9%)	112 (34.5%)	**159 (48.9%)**
To provide a place for wildlife to live *n=326, M=3.33*	11 (3.4%)	38 (11.7%)	109 (33.4%)	**326 (51.5%)**
For land investment (e.g., sale in the future) *n=322, M=2.26*	93 (28.9%)	**95 (29.5%)**	91 (28.3%)	43 (13.4%)
For privacy *n=325, M=3.38*	15 (4.6%)	29 (8.9%)	97 (29.8%)	**184 (56.6%)**
To pass land on to my heirs *n=325, M=2.70*	59 (18.2%)	79 (24.4%)	85 (26.2%)	**101 (31.2%)**
For production of timber products for sale *n=325, M=1.64*	**185 (56.9%)**	83 (25.5%)	46 (14.2%)	11 (3.4%)
For production of timber products for my family's use *n=325, M=1.79*	**154 (47.4%)**	102 (31.4%)	53 (16.3%)	16 (4.9%)
For non-timber forest products (e.g., maple syrup) *n=323, M=1.38*	**234 (72.4%)**	63 (19.5%)	19 (5.9%)	7 (2.2%)
For farming *n=324, M=1.70*	**194 (59.9%)**	64 (19.8%)	36 (11.1%)	30 (9.3%)
For hunting or fishing *n=325, M=2.62*	98 (30.2%)	46 (14.2%)	63 (19.4%)	**118 (36.3%)**
For birding or birdwatching *n=323, M=2.63*	54 (16.7%)	87 (26.9%)	**103 (31.9%)**	79 (24.5%)
For recreation that isn't wildlife related *n=321, M=2.68*	50 (15.6%)	77 (24.0%)	**120 (37.4%)**	74 (23.1%)
Other (please specify): *n=33, M=3.85*	0 (0.0%)	0 (0.0%)	5 (15.2%)	**28 (84.8%)**

For mean calculations, items coded as 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important

Large (50 or more acres) Landowner Responses

Reasons you own your land	Not at all important	Slightly important	Moderately important	Very important
To enjoy the scenery *n=662, M=3.43*	11 (1.7%)	62 (9.4%)	219 (33.1%)	**370 (55.9%)**
To protect nature *n=653, M=3.34*	14 (2.1%)	79 (12.1%)	233 (35.7%)	**327 (50.1%)**
To provide a place for wildlife to live *n=654, M=3.37*	17 (2.6%)	78 (11.9%)	203 (31.0%)	**356 (54.4%)**
For land investment (e.g., sale in the future) *n=659, M=2.38*	**188 (28.5%)**	166 (25.2%)	173 (26.3%)	132 (20.0%)
For privacy *n=667, M=3.42*	27 (4.0%)	57 (8.5%)	191 (28.6%)	**392 (58.8%)**
To pass land on to my heirs *n=664, M=2.98*	86 (13.0%)	126 (19.0%)	170 (25.6%)	**282 (42.5%)**
For production of timber products for sale *n=663, M=2.42*	**156 (23.5%)**	200 (30.2%)	182 (27.5%)	125 (18.9%)
For production of timber products for my family's use *n=661, M=2.92*	186 (28.1%)	**190 (28.7%)**	**190 (28.7%)**	95 (14.4%)
For non-timber forest products (e.g., maple syrup) *n=655, M=1.64*	**385 (58.8%)**	158 (24.1%)	73 (11.1%)	39 (6.0%)
For farming *n=659, M=2.44*	**205 (31.1%)**	126 (19.1%)	158 (24.0%)	170 (25.8%)
For hunting or fishing *n=662, M=3.06*	94 (14.2%)	96 (14.5%)	147 (22.2%)	**325 (49.1%)**
For birding or birdwatching *n=657, M=2.53*	134 (20.4%)	183 (27.9%)	**200 (30.4%)**	140 (21.3%)
For recreation that isn't wildlife related *n=656, M=2.72*	106 (16.2%)	149 (22.7%)	**225 (34.3%)**	176 (26.8%)
Other (please specify): *n=64, M=3.73*	0 (0.0%)	1 (1.6%)	15 (23.4%)	**48 (75.0%)**

For mean calculations, items coded as 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important

8. **We're interested in knowing your views about the management of land and wildlife (as we define on the inside front cover). To what extent do you agree or disagree with each of the following?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Views about land and wildlife	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Land should be managed so that people benefit. *n=314, M=3.53*	16 (4.7%)	34 (10.8%)	75 (23.9%)	**146 (46.5%)**	43 (13.7%)
Trees and plants have value, regardless of people's uses for them. *n=329, M=4.34*	5 (1.5%)	3 (0.9%)	3 (1.5%)	**177 (53.8%)**	139 (42.2%)
People's needs should take priority over conservation of the land. *n=327, M=2.40*	62 (19.0%)	**133 (40.7%)**	82 (25.1%)	40 (12.2%)	10 (3.1%)
Land, and the plants and trees on it, should be left to exist naturally without being managed by people. *n=326, M=2.71*	28 (8.6%)	**132 (40.5%)**	92 (28.2%)	55 (12.3%)	19 (4.0%)
Wildlife should be managed so that people benefit. *n=325, M=3.23*	25 (7.7%)	65 (20.0%)	79 (24.3%)	**121 (37.2%)**	35 (10.8%)
Wildlife have value, regardless of people's uses for them. *n=329, M=4.30*	4 (1.2%)	7 (2.1%)	9 (2.7%)	**176 (53.5%)**	133 (40.4%)
People's needs should take priority over conservation of wildlife. *n=328, M=2.30*	71 (21.6%)	**140 (42.7%)**	79 (24.1%)	25 (7.6%)	13 (4.0%)
Wildlife should be left to exist naturally without being managed by people. *n=329, M=2.79*	27 (8.2%)	**131 (39.8%)**	79 (24.0%)	68 (20.7%)	24 (7.3%)
Wildlife benefits from management by people. *n=325, M=3.68*	8 (2.5%)	18 (5.5%)	84 (25.8%)	**176 (54.2%)**	39 (12.0%)
Land benefits from management by people. *n=327, M=3.73*	7 (2.1%)	19 (5.8%)	69 (21.1%)	**193 (59.0%)**	39 (11.9%)
To benefit wildlife, land is best left untouched. *n=325, M=2.71*	31 (9.5%)	**129 (39.7%)**	86 (26.5%)	62 (19.1%)	17 (5.2%)
Generally, cutting trees on the land is good for wildlife. *n=327, M=3.24*	17 (5.2%)	62 (19.0%)	94 (28.7%)	**133 (40.7%)**	21 (6.4%)

For mean calculations, items coded as 1=Strongly Disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree

Large (50 or more acres) Landowner Responses

Views about land and wildlife	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Land should be managed so that people benefit. *n=655, M=3.67*	27 (4.1%)	57 (8.7%)	145 (22.1%)	**305 (46.6%)**	121 (18.5%)
Trees and plants have value, regardless of people's uses for them. *n=664, M=4.38*	3 (0.5%)	4 (0.6%)	26 (3.9%)	**335 (50.5%)**	296 (44.6%)
People's needs should take priority over conservation of the land. *n=662, M=2.48*	107 (16.2%)	**269 (40.6%)**	174 (26.3%)	87 (13.1%)	25 (3.8%)
Land, and the plants and trees on it, should be left to exist naturally without being managed by people. *n=661, M=2.34*	96 (14.5%)	**355 (53.7%)**	123 (18.6%)	66 (10.0%)	21 (3.2%)
Wildlife should be managed so that people benefit. *n=661, M=3.37*	46 (7.0%)	109 (16.5%)	143 (21.6%)	**278 (42.1%)**	85 (12.9%)
Wildlife have value, regardless of people's uses for them. *n=661, M=4.27*	7 (1.1%)	12 (1.8%)	38 (5.7%)	**340 (51.4%)**	264 (39.9%)
People's needs should take priority over conservation of wildlife. *n=663, M=2.44*	133 (20.1%)	**251 (37.9%)**	165 (24.9%)	84 (12.7%)	30 (4.5%)
Wildlife should be left to exist naturally without being managed by people. *n=663, M=2.60*	88 (13.3%)	**289 (43.6%)**	135 (20.4%)	103 (15.5%)	48 (7.2%)
Wildlife benefits from management by people. *n=664, M=3.74*	17 (2.6%)	56 (8.4%)	134 (20.2%)	**335 (50.5%)**	122 (18.4%)
Land benefits from management by people. *n=657, M=3.95*	7 (1.1%)	27 (4.1%)	96 (14.6%)	**389 (59.2%)**	138 (21.0%)
To benefit wildlife, land is best left untouched. *n=662, M=2.44*	100 (15.1%)	**311 (47.0%)**	138 (20.8%)	84 (12.7%)	29 (4.4%)
Generally, cutting trees on the land is good for wildlife. *n=659, M=3.64*	12 (1.8%)	76 (11.5%)	155 (23.5%)	**312 (47.3%)**	104 (15.8%)

For mean calculations, items coded as 1=Strongly Disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree

9. **The following are activities some landowners might do (or have others do for them) on their land. Which of these have you done in the last 10 years, and which are you likely to do in the next 5 years?** *(Check one box in each row and column.)*

Small (10-49 acres) Landowner Responses

Activities	**Have you done this activity in the last 10 years?**	**How likely are you to do the activity in the next 5 years?**
Cut a patch of trees (at least ½ acre) where all or most of the trees were removed (to open the canopy) and plants and trees were allowed to grow back *n=304, n=315*	□ Yes 72 (23.7%) □ **No 232 (76.3%)** □ I do not own land with woods. 20	□ **Not at all 163 (47.5%)** □ Slightly 99 (31.4%) □ Moderately 33 (10.5%) □ Very 20 (6.3%)
Cut single trees scattered throughout all or a part of your woodland *n=312, n=314*	□ **Yes 219 (63.8%)** □ No 93 (27.1%) □ I do not own land with woods. 16	□ Not at all 56 (17.8%) □ **Slightly 104 (33.1%)** □ Moderately 80 (25.5%) □ Very 74 (23.6%)

Large (50 or more acres) Landowner Responses

Activities	**Have you done this activity in the last 10 years?**	**How likely are you to do the activity in the next 5 years?**
Cut a patch of trees (at least ½ acre) where all or most of the trees were removed (to open the canopy) and plants and trees were allowed to grow back *n=653, n=649*	□ Yes 228 (34.9%) □ **No 425 (65.1%)** □ I do not own land with woods. 7	□ **Not at all 293 (45.1%)** □ Slightly 167 (25.7%) □ Moderately 98 (15.1%) □ Very 91 (14.0%)
Cut single trees scattered throughout all or a part of your woodland *n=661, n=655*	□ **Yes 528 (79.9%)** □ No 133 (20.1%) □ I do not own land with woods. 8	□ Not at all 77 (11.8%) □ Slightly 164 (25.0%) □ Moderately 154 (23.5%) □ **Very 260 (39.7%)**

10. **How bad or good do you believe these activities are for <u>your land</u>?** *(Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Activities	Very Bad	Bad	Neither	Good	Very Good
Cutting a patch of trees (at least ½ acre) *n=330, M=3.10*	20 (6.2%)	64 (19.7%)	**125 (38.5%)**	97 (29.8%)	19 (5.8%)
Cutting single trees scattered throughout the woods *n=330, M=3.89*	2 (0.6%)	11 (3.3%)	66 (20.0%)	**193 (58.5%)**	58 (17.6%)

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

Large (50 or more acres) Landowner Responses

Activities	Very Bad	Bad	Neither	Good	Very Good
Cutting a patch of trees (at least ½ acre) *n=663, M=3.35*	35 (5.3%)	110 (16.6%)	**212 (32.0%)**	200 (30.2%)	106 (16.0%)
Cutting single trees scattered throughout the woods *n=665, M=4.14*	4 (0.6%)	5 (0.8%)	103 (15.5%)	**333 (50.1%)**	220 (33.1%)

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

11. **How bad or good do you believe these activities are for <u>wildlife</u>?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Activities	Very Bad	Bad	Neither	Good	Very Good
Cutting a patch of trees (at least ½ acre) *n=329, M=3.25*	19 (5.8%)	56 (17.1%)	**114 (34.8%)**	102 (31.1%)	37 (11.3%)
Cutting single trees scattered throughout the woods *n=328, M=3.67*	3 (0.9%)	9 (2.7%)	128 (39.0%)	**142 (43.3%)**	46 (14.0%)

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

Large (50 or more acres) Landowner Responses

Activities	Very Bad	Bad	Neither	Good	Very Good
Cutting a patch of trees (at least ½ acre) *n=660, M=3.54*	31 (4.7%)	91 (13.8%)	170 (25.8%)	**225 (34.1%)**	143 (21.7%)
Cutting single trees scattered throughout the woods *n=658, M=3.84*	5 (0.8%)	14 (2.1%)	191 (29.0%)	**317 (48.2%)**	131 (19.9%)

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

12. **How common is it that other landowners in your area do these activities?** (*Check one choice for each row.)*

Small (10-49 acres) Landowner Responses

Activities	Not at all Common	Slightly Common	Moderately Common	Very Common	Don't Know
Cutting a patch of trees (at least ½ acre) *n=235, M=2.19*	72 (30.6%)	**73 (31.1%)**	64 (27.2%)	26 (11.1%)	**96**
Cutting single trees scattered throughout the woods *n=242, M=3.20*	13 (5.4%)	43 (17.8%)	68 (28.1%)	**118 (48.8%)**	87

For mean calculations, items coded as 1=Not at all common, 2=Slightly common, 3=Moderately common, 4=Very common

Large (50 or more acres) Landowner Responses

Activities	Not at all Common	Slightly Common	Moderately Common	Very Common	Don't Know
Cutting a patch of trees (at least ½ acre) *n=501, M=2.19*	**172 (34.3%)**	133 (26.5%)	126 (25.1%)	70 (14.0%)	**164**
Cutting single trees scattered throughout the woods *n=544, M=3.26*	34 (6.3%)	74 (13.6%)	154 (28.3%)	**282 (51.8%)**	544

For mean calculations, items coded as 1=Not at all common, 2=Slightly common, 3=Moderately common, 4=Very common

13. **When it comes to the activities you do on your land, how important to you are the opinions of each of the following groups?** (*Check one box for row.)*

Small (10-49 acres) Landowner Responses

Groups of people	Not at all Important	Slightly Important	Moderately Important	Very Important
My family *n=332, M=2.92*	50 (15.1%)	63 (19.0%)	82 (24.7%)	**137 (41.3%)**
My friends *n=332, M=2.11*	**120 (36.1%)**	92 (27.7%)	82 (24.7%)	38 (11.4%)
Nearby landowners *n=333, M=2.14*	101 (30.3%)	**114 (34.2%)**	88 (26.4%)	30 (9.0%)
Forest professionals *n=331, M=2.56*	80 (24.2%)	62 (18.7%)	**113 (34.1%)**	76 (23.0%)
Wildlife professionals *n=332, M=2.66*	66 (19.9%)	61 (18.4%)	**125 (37.7%)**	80 (24.1%)

For mean calculations, items coded as 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important

Large (50 or more acres) Landowner Responses

Groups of people	Not at all Important	Slightly Important	Moderately Important	Very Important
My family *n=673, M=3.09*	65 (9.7%)	103 (15.3%)	210 (31.2%)	**295 (43.8%)**
My friends *n=669, M=2.19*	**205 (30.6%)**	203 (30.3%)	192 (28.7%)	69 (10.3%)
Nearby landowners *n=667, M=2.05*	226 (33.9%)	**237 (35.5%)**	151 (22.6%)	53 (7.9%)
Forest professionals *n=664, M=2.71*	104 (15.7%)	161 (24.2%)	**225 (33.9%)**	174 (26.2%)
Wildlife professionals *n=669, M=2.66*	116 (17.3%)	163 (24.4%)	**221 (33.0%)**	169 (25.3%)

For mean calculations, items coded as 1=Not at all important, 2=Slightly important, 3=Moderately important, 4=Very important

14. **How bad or good do these groups of people think cutting a patch of trees (at least ½ acre) where all or most of the trees were removed would be for your land?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Groups of people	Very Bad	Bad	Neither	Good	Very Good	Don't Know
My family *n=236, M=2.89*	29 (12.3%)	48 (20.3%)	**97 (41.1%)**	45 (19.1%)	17 (7.2%)	83
My friends *n=205, M=2.97*	11 (5.4%)	38 (18.5%)	**111 (54.1%)**	36 (17.6%)	9 (4.4%)	115
Nearby landowners *n=192, M=2.94*	10 (5.2%)	36 (18.8%)	**108 (56.3%)**	31 (16.1%)	7 (3.6%)	128
Forest professionals *n=191, M=3.24*	16 (8.4%)	31 (16.2%)	**68 (35.6%)**	43 (22.5%)	33 (17.3%)	191
Wildlife professionals *n=190, M=3.23*	18 (9.5%)	31 (16.3%)	**65 (34.2%)**	41 (21.6%)	35 (18.4%)	130

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

Large (50 or more acres) Landowner Responses

Groups of people	Very Bad	Bad	Neither	Good	Very Good	Don't Know
My family *n=516, M=3.10*	53 (10.3%)	110 (21.3%)	**175 (33.9%)**	90 (17.4%)	88 (17.1%)	135
My friends *n=451, M=3.16*	30 (6.7%)	76 (16.9%)	**194 (43.0%)**	95 (21.1%)	56 (12.4%)	197
Nearby landowners *n=391, M=3.11*	20 (5.0%)	64 (16.1%)	**203 (51.1%)**	73 (18.4%)	37 (9.3%)	245
Forest professionals *n=403, M=3.54*	26 (6.5%)	70 (17.4%)	80 (19.9%)	**114 (28.3%)**	113 (28.0%)	239
Wildlife professionals *n=401, M=3.64*	24 (6.0%)	61 (15.2%)	76 (19.0%)	114 (28.4%)	**126 (31.4%)**	241

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

15. **How bad or good do these groups of people think <u>cutting single trees scattered throughout all or a part of your woodland</u> would be for your land?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Groups of people	Very Bad	Bad	Neither	Good	Very Good	Don't Know
My family *n=253, M=3.66*	4 (1.6%)	10 (4.0%)	94 (37.2%)	**106 (41.9%)**	39 (15.4%)	70
My friends *n=218, M=3.56*	2 (0.9%)	7 (3.2%)	**103 (47.2%)**	80 (36.7%)	26 (11.9%)	106
Nearby landowners *n=197, M=3.51*	2 (1.0%)	7 (3.6%)	**101 (51.3%)**	63 (32.0%)	24 (12.2%)	126
Forest professionals *n=203, M=3.78*	3 (1.5%)	11 (5.4%)	66 (32.5%)	**70 (34.5%)**	53 (26.1%)	120
Wildlife professionals *n=199, M=3.71*	2 (1.0%)	11 (5.5%)	**75 (37.7%)**	66 (33.2%)	45 (22.6%)	125

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

Large (50 or more acres) Landowner Responses

Groups of people	Very Bad	Bad	Neither	Good	Very Good	Don't Know
My family *n=545, M=3.97*	10 (1.8%)	10 (1.8%)	145 (26.6%)	**202 (37.1%)**	178 (32.7%)	110
My friends *n=472, M=3.78*	11 (2.3%)	6 (1.3%)	**172 (36.4%)**	**172 (36.4%)**	111 (23.5%)	183
Nearby landowners *n=428, M=3.71*	6 (1.4%)	7 (1.6%)	**182 (42.5%)**	144 (33.6%)	89 (20.8%)	223
Forest professionals *n=443, M=4.19*	5 (1.1%)	6 (1.4%)	75 (16.9%)	172 (38.8%)	**185 (41.8%)**	206
Wildlife professionals *n=405, M=4.04*	4 (1.0%)	10 (2.5%)	88 (21.7%)	**165 (40.7%)**	138 (34.1%)	243

For mean calculations, items coded as 1=Very Bad, 2=Bad, 3=Neither, 4=Good, 5=Very Good

16. **To what extent do you feel you are able to get the following activities done on your land (if you decide to do so)?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Activities	Not at all Able	Slightly Able	Moderately Able	Very Able
Cutting a patch of trees (at least ½ acre) *n=325, M=2.87*	55 (16.9%)	61 (18.8%)	80 (24.7%)	**129 (39.7%)**
Cutting single trees scattered throughout the woods *n=325, M=3.33*	28 (8.6%)	30 (9.2%)	75 (23.1%)	**192 (59.1%)**

For mean calculations, items coded as 1=Not at all Able, 2=Slightly Able, 3=Moderately Able, 4=Very Able

Large (50 or more acres) Landowner Responses

Activities	Not at all Able	Slightly Able	Moderately Able	Very Able
Cutting a patch of trees (at least ½ acre) *n=658, M=3.05*	81 (12.3%)	110 (16.7%)	165 (25.1%)	**302 (45.9%)**
Cutting single trees scattered throughout the woods *n=660, M=3.48*	29 (4.4%)	47 (7.1%)	165 (25.0%)	**419 (63.5%)**

For mean calculations, items coded as 1=Not at all Able, 2=Slightly Able, 3=Moderately Able, 4=Very Able

17. **Do you agree or disagree that the following action would benefit wildlife in the following areas?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Cutting a patch of trees (at least ½ acre) on my land would benefit wildlife….	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**	**Don't Know**
on my property. *n=274, M=3.05*	36 (13.1%)	56 (20.4%)	71 (25.9%)	**80 (29.2%)**	31 (11.3%)	49
on properties neighboring mine. *n=255, M=3.12*	29 (11.4%)	49 (19.2%)	68 (26.7%)	**80 (31.4%)**	29 (11.4%)	68
in my local area. *n=253, M=3.19*	29 (11.5%)	43 (17.0%)	63 (24.9%)	**86 (34.0%)**	32 (12.6%)	69

For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly agree

Large (50 or more acres) Landowner Responses

Cutting a patch of trees (at least ½ acre) on my land would benefit wildlife….	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**	**Don't Know**
on my property. *n=580, M=3.42*	61 (10.5%)	95 (16.4%)	104 (17.9%)	**181 (31.2%)**	139 (24.0%)	79
on properties neighboring mine. *n=529, M=3.41*	45 (8.5%)	82 (15.5%)	120 (22.7%)	**174 (32.9%)**	108 (20.4%)	129
in my local area. *n=518, M=3.37*	45 (8.7%)	79 (15.3%)	130 (25.1%)	**165 (39.1%)**	99 (19.1%)	139

For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly agree

18. **Do you agree or disagree that the following action would benefit wildlife in the following areas?** (*Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Cutting single trees scattered throughout the woods on my land would benefit wildlife….	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**	**Don't Know**
on my property. *n=284, M=3.64*	10 (3.5%)	31 (10.9%)	62 (21.8%)	**128 (45.1%)**	53 (18.7%)	41
on properties neighboring mine. *n=263, M=3.59*	8 (3.0%)	30 (11.4%)	70 (26.6%)	**110 (41.8%)**	45 (17.1%)	59
in my local area. *n=263, M=3.60*	7 (2.7%)	28 (10.6%)	72 (27.4%)	**111 (42.2%)**	45 (17.1%)	60

For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly agree

Large (50 or more acres) Landowner Responses

Cutting single trees scattered throughout the woods on my land would benefit wildlife….	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**	**Don't Know**
on my property. *n=596, M=3.84*	20 (3.4%)	33 (5.5%)	119 (20.0%)	**273 (45.8%)**	151 (25.3%)	65
on properties neighboring mine. *n=533, M=3.71*	16 (3.0%)	31 (5.8%)	152 (28.5%)	**224 (42.0%)**	110 (20.6%)	126
in my local area. *n=533, M=3.68*	16 (3.0%)	38 (7.1%)	153 (28.7%)	**222 (41.7%)**	104 (19.5%)	127

For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly agree

19. **Do you agree or disagree that the extent to which you cut on your land is limited by the following factors?** *(Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Factors	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
I don't have enough time. *n=318, M=3.02*	28 (8.8%)	84 (26.4%)	87 (27.4%)	**93 (29.2%)**	26 (8.2%)
I don't have enough money. *n=319, M=2.74*	34 (10.7%)	100 (31.3%)	**118 (37.0%)**	50 (15.7%)	17 (5.3%)
I don't have a market for products. *n=316, M=2.83*	30 (9.5%)	87 (27.5%)	**122 (38.6%)**	60 (19.0%)	17 (5.4%)
I don't have enough knowledge about how and where to cut. *n=321, M=2.99*	31 (9.7%)	95 (29.6%)	67 (20.9%)	**102 (31.8%)**	26 (8.1%)
I don't have enough knowledge about why to cut. *n=321, M=2.94*	32 (10.0%)	**97 (30.2%)**	75 (23.4%)	91 (28.3%)	26 (8.1%)
I don't have someone skilled enough to do the work. *n=321, M=2.55*	49 (15.3%)	**135 (42.1%)**	62 (19.3%)	61 (19.0%)	14 (4.4%)
I don't have adequate equipment or tools to do the work. *n=320, M=2.68*	46 (14.4%)	**121 (37.8%)**	64 (20.0%)	67 (20.9%)	22 (6.9%)
I don't have enough support from foresters. *n=320, M=2.89*	22 (6.9%)	73 (22.8%)	**163 (50.9%)**	42 (13.1%)	20 (6.3%)
I don't have enough support from wildlife biologists. *n=319, M=3.00*	16 (5.0%)	62 (19.4%)	**169 (53.0%)**	51 (16.0%)	21 (6.6%)
I don't have supportive state and local regulations. *n=317, M=2.87*	24 (7.6%)	57 (18.0%)	**183 (57.7%)**	43 (13.6%)	10 (3.2%)
I don't have enough acreage. *n=320, M=2.75*	39 (12.2%)	**112 (35.0%)**	81 (25.3%)	65 (20.3%)	23 (7.2%)
I don't think it is the right thing to do. *n=323, M=2.67*	40 (12.4%)	**116 (35.9%)**	101 (31.3%)	44 (13.6%)	22 (6.8%)
I don't like the look of it. *n=321, M=2.84*	32 (10.0%)	93 (29.0%)	**114 (35.5%)**	59 (18.4%)	23 (7.2%)
Other (please specify _____) *n=9, M=4.11*	2 (22.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**7 (77.8%)**

For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly agree

Large (50 or more acres) Landowner Responses

Factors	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I don't have enough time. *n=641, M=3.09*	57 (8.9%)	153 (23.9%)	166 (25.9%)	**203 (31.7%)**	62 (9.7%)
I don't have enough money. *n=641, M=2.75*	76 (11.9%)	202 (31.5%)	**205 (32.0%)**	124 (19.3%)	34 (5.3%)
I don't have a market for products. *n=639, M=2.80*	61 (9.5%)	198 (31.0%)	**216 (33.8%)**	138 (21.6%)	26 (4.1%)
I don't have enough knowledge about how and where to cut. *n=649, M=2.78*	103 (15.9%)	**208 (32.0%)**	119 (18.3%)	164 (25.3%)	55 (8.5%)
I don't have enough knowledge about why to cut. *n=646, M=2.66*	103 (15.9%)	**238 (36.8%)**	118 (18.3%)	149 (23.1%)	38 (5.9%)
I don't have someone skilled enough to do the work. *n=648, M=2.40*	123 (19.0%)	**287 (44.3%)**	118 (18.2%)	95 (14.7%)	25 (3.9%)
I don't have adequate equipment or tools to do the work. *n=648, M=2.61*	117 (18.1%)	**247 (38.1%)**	101 (15.6%)	140 (21.6%)	43 (6.6%)
I don't have enough support from foresters. *n=641, M=2.71*	77 (12.0%)	177 (27.6%)	**271 (42.3%)**	88 (13.7%)	28 (4.4%)
I don't have enough support from wildlife biologists. *n=643, M=2.92*	61 (9.5%)	117 (18.2%)	**313 (48.7%)**	117 (18.2%)	35 (5.4%)
I don't have supportive state and local regulations. *n=637, M=2.87*	61 (9.6%)	116 (18.2%)	**338 (53.1%)**	88 (13.8%)	34 (5.3%)
I don't have enough acreage. *n=643, M=2.12*	160 (24.9%)	**312 (48.5%)**	122 (19.0%)	34 (5.3%)	15 (2.3%)
I don't think it is the right thing to do. *n=644, M=2.34*	133 (20.7%)	**260 (40.4%)**	175 (27.2%)	53 (8.2%)	23 (3.6%)
I don't like the look of it. *n=635, M=2.62*	95 (15.0%)	207 (32.6%)	**207 (32.6%)**	97 (15.3%)	29 (4.6%)
Other (please specify _____) *n=25, M=4.40*	0 (0.0%)	0 (0.0%)	4 (16.0%)	7 (28.0%)	**14 (56.0%)**

For mean calculations, items coded as 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly agree

20. **To what extent would any of the following conditions increase your willingness to <u>cut more patches of trees (at least ½ acre)</u> on your land than you do now?** *(Check one box for each row.)*

Small (10-49 acres) Landowner Responses

Would your willingness increase if you…	Not Increase	Slightly Increase	Moderately Increase	Greatly Increase
received financial assistance or tax reduction? *n=323, M=2.29*	**116 (35.9%)**	69 (21.4%)	67 (20.7%)	71 (22.0%)
found a market for the cut wood? *n=321, M=1.91*	**159 (49.5%)**	68 (21.2%)	57 (17.8%)	37 (11.5%)
received advice by an expert on the activity? *n=320, M=2.29*	**99 (30.9%)**	81 (25.3%)	89 (27.8%)	51 (15.9%)
had a plan for your land that called for such cuts? *n=321, M=2.26*	**111 (34.6%)**	69 (21.5%)	89 (27.7%)	52 (16.2%)
could borrow free equipment? *n=320, M=1.88*	**173 (54.1%)**	57 (17.8%)	47 (14.7%)	43 (13.4%)
could receive labor to conduct the activity? *n=322, M=2.05*	**148 (46.0%)**	63 (19.6%)	57 (17.7%)	54 (16.8%)
learned that the activity benefits wildlife? *n=320, M=2.53*	71 (22.2%)	**86 (26.9%)**	**86 (26.9%)**	77 (24.1%)
learned that the activity benefits rare wildlife? *n=317, M=2.58*	70 (22.1%)	76 (24.0%)	**89 (28.1%)**	82 (25.9%)
found more people doing it in your area? *n=319, M=1.57*	**203 (63.6%)**	63 (19.7%)	39 (12.2%)	14 (4.4%)
found that very few people were doing it in your area? *n=315, M=1.40*	**231 (73.3%)**	49 (15.6%)	28 (8.9%)	7 (2.2%)
earned recognition from the state agency or a non-profit? *n=320, M=1.50*	**221 (69.1%)**	55 (17.2%)	27 (8.4%)	17 (5.3%)
owned more land? *n=311, M=2.25*	**121 (38.9%)**	59 (19.0%)	63 (20.3%)	68 (21.9%)

For mean calculations, items coded as 1=Not increase, 2=Slightly increase, 3=Moderately increase, 4=Greatly increase

Large (50 or more acres) Landowner Responses

Would your willingness increase if you…	Not Increase	Slightly Increase	Moderately Increase	Greatly Increase
received financial assistance or tax reduction? *n=658, M=2.58*	**169 (25.7%)**	138 (21.0%)	149 (22.6%)	202 (30.7%)
found a market for the cut wood? *n=648, M=2.15*	**246 (38.0%)**	149 (23.0%)	161 (24.8%)	92 (14.2%)
received advice by an expert on the activity? *n=652, M=2.38*	**182 (27.9%)**	163 (25.0%)	184 (28.2%)	123 (18.9)
had a plan for your land that called for such cuts? *n=651, M=2.36*	**188 (28.9%)**	165 (25.3%)	176 (27.0%)	122 (18.7%)
could borrow free equipment? *n=648, M=1.84*	**353 (54.5%)**	117 (18.1%)	105 (16.2%)	73 (11.3%)
could receive labor to conduct the activity? *n=651, M=2.14*	**264 (40.6%)**	140 (21.5%)	137 (21.0%)	110 (16.9%)
learned that the activity benefits wildlife? *n=645, M=2.45*	163 (25.3%)	164 (25.4%)	**183 (28.4%)**	135 (20.9%)
learned that the activity benefits rare wildlife? *n=642, M=2.54*	152 (23.7%)	149 (23.2%)	**183 (28.5%)**	158 (24.6%)
found more people doing it in your area? *n=646, M=1.59*	**397 (61.5%)**	147 (22.8%)	69 (10.7%)	33 (5.1%)
found that very few people were doing it in your area? *n=645, M=1.43*	**462 (71.6%)**	110 (17.1%)	50 (7.8%)	41 (3.6%)
earned recognition from the state agency or a non-profit? *n=647, M=1.51*	**435 (67.2%)**	125 (19.3%)	59 (9.1%)	2 (4.3%)
owned more land? *n=638, M=1.81*	**365 (57.2%)**	96 (15.0%)	109 (17.1%)	68 (10.7%)

For mean calculations, items coded as 1=Not increase, 2=Slightly increase, 3=Moderately increase, 4=Greatly increase

21. **From which of these sources have you heard or read about land management for wildlife <u>and</u> how much have the sources influenced your beliefs?** *(Check one box in each row and column.)*

Small (10-49 acres) Landowner Responses

Information sources about management for wildlife	How much have you heard or read from this source?	How much has this source influenced you?
NY Department of Environmental Conservation *n=330, n=283*	□ **None 128 (38.8%)** □ A little 84 (25.5%) □ Some 93 **(**28.2%) □ A lot 25 (7.6%)	□ **None 137 (48.4%)** □ A little 59 (20.8%) □ Some 71 (25.1%) □ A lot 16 (5.7%)
Soil and Water Conservation District or Natural Resource Conservation Service *n=329, n=277*	□ **None 202 (61.4%)** □ A little 64 (19.5%) □ Some 54 (16.4%) □ A lot 9 (2.7%)	□ **None 184 (66.4%)** □ A little 45 (16.2%) □ Some 40(14.4%) □ A lot 8 (2.9%)
Cornell Cooperative Extension *n=326, n=277*	□ **None 170 (52.1%)** □ A little 80 (24.5%) □ Some 67 (20.6%) □ A lot 9 (2.8%)	□ **None 160 (57.8%)** □ A little 59 (21.3%) □ Some 48 (17.3%) □ A lot 10 (3.6%)
Master Forest Owner volunteer *n=321, n=263*	□ **None 291 (90.7%)** □ A little 12 (3.7%) □ Some 13 (4.0%) □ A lot 5 (1.6%)	□ **None 242 (92.0%)** □ A little 8 (3.0%) □ Some 5 (1.9%) □ A lot 8 (3.0%)
Forest owner association (e.g., NY Forest Owners Association) *n=328, n=272*	□ **None 293 (89.3%)** □ A little 22 (6.7%) □ Some 11 (3.4%) □ A lot 2 (0.6%)	□ **None 248 (91.2%)** □ A little 15 (5.5%) □ Some 5 (1.8%) □ A lot 4 (1.5%)
Private/consulting foresters *n=326, n=276*	□ **None 239 (73.3%)** □ A little 39 (12.0%) □ Some 33 (10.1%) □ A lot 15 (4.6%)	□ **None 214 (77.5%)** □ A little 22 (8.0%) □ Some 25 (9.1%) □ A lot 15 (5.4%)
Private/consulting wildlife biologists *n=327, n=272*	□ **None 301 (92.0%)** □ A little 15 (4.6%) □ Some 8 (2.4%) □ A lot 3 (0.9%)	□ **None 257 (94.5%)** □ A little 8 (2.9%) □ Some 4 (1.5%) □ A lot 3 (1.1%)
Non-profit wildlife group related to hunted species (e.g., Ruffed Grouse Society) *n=329, n=276*	□ **None 282 (85.7%)** □ A little 22 (6.7%) □ Some 22 (6.7%) □ A lot 3 (0.9%)	□ **None 239 (86.6%)** □ A little 13 (4.7%) □ Some 20 (7.2%) □ A lot 4 (1.4%)
Non-profit wildlife group NOT related to hunted species (e.g., Audubon) *n=328, n=275*	□ **None 266 (81.1%)** □ A little 33 (10.1%) □ Some 25 (7.6%) □ A lot 4 (1.2%)	□ **None 230 (83.6%)** □ A little 22 (8.0%) □ Some 20 (7.3%) □ A lot 3 (1.1%)
Friends/family members *n=328, n=280*	□ **None 151 (46.0%)** □ A little 91(27.7%) □ Some 718 (21.6%) □ A lot 15 (4.6%)	□ **None 135 (48.2%)** □ A little 70 (25.0%) □ Some 60 (21.4%) □ A lot 15 (5.4%)

Other woodland owners *n=328, n=279*	□ **None 200 (61.0%)** □ A little 80 (24.4%) □ Some 40 (12.2%) □ A lot 8 (2.4%)	□ **None 178 (63.8%)** □ A little 59 (21.1%) □ Some 36 (12.9%) □ A lot 6 (2.2%)
Other (_____) *n=14, n=14*	□ **None** 1 (7.1%) □ A little 0 (0.0%) □ Some **8 (57.1%)** □ A lot 5 (35.7%)	□ **None** 1 (7.1%) □ A little 1 (7.1%) □ Some 7 **(50.0%)** □ A lot 5 (35.7%)

Large (50 or more acres) Landowner Responses

Information sources about management for wildlife	How much have you heard or read from this source?	How much has this source influenced you?
NY Department of Environmental Conservation *n=666, n=602*	□ **None** 182 (27.3%) □ A little 197 (29.6%) □ Some **230 (34.5%)** □ A lot 57 (8.6%)	□ **None 232 (38.5%)** □ A little 158 (26.2%) □ Some 164 (27.2%) □ A lot 48 (8.0%)
Soil and Water Conservation District or Natural Resource Conservation Service *n=660, n=589*	□ **None 282 (42.7%)** □ A little 158 (23.9%) □ Some 173 (26.2%) □ A lot 47 (7.1%)	□ **None 286 (48.6%)** □ A little 134 (22.8%) □ Some 122 (20.7%) □ A lot 47 (8.0%)
Cornell Cooperative Extension *n=660, n=592*	□ **None** 260 **(39.4%)** □ A little 191 (28.9%) □ Some 163 (24.7%) □ A lot 46 (7.0%)	□ **None 275 (46.5%)** □ A little 148 (25.0%) □ Some 131 (22.1%) □ A lot 38 (6.4%)
Master Forest Owner volunteer *n=646, n=572*	□ **None 553 (85.6%)** □ A little 46 (7.1%) □ Some 36 (5.6%) □ A lot 11 (1.7%)	□ **None 486 (85.0%)** □ A little 34 (5.9%) □ Some 34 (5.9%) □ A lot 18 (3.1%)
Forest owner association (e.g., NY Forest Owners Association) *n=655, n=583*	□ **None 517 (78.9%)** □ A little 72 (11.0%) □ Some 46 (7.0%) □ A lot 20 (3.1%)	□ **None 465 (79.8%)** □ A little 59 (10.1%) □ Some 42 (7.2%) □ A lot 17 (2.9%)
Private/consulting foresters *n=652, n=583*	□ **None 320 (49.1%)** □ A little 123 (18.9%) □ Some 143 (21.9%) □ A lot 66 (10.1%)	□ **None 294 (50.4%)** □ A little 98 (16.8%) □ Some 124 (21.3%) □ A lot 67 (11.5%)
Private/consulting wildlife biologists *n=654, n=578*	□ **None 575 (87.9%)** □ A little 35 (5.4%) □ Some 32 (4.9%) □ A lot 12 (1.8%)	□ **None 503 (87.0%)** □ A little 25 (4.3%) □ Some 29 (5.0%) □ A lot 21 (3.6%)
Non-profit wildlife group related to hunted species (e.g., Ruffed Grouse Society) *n=658, n=581*	□ **None 551 (83.7%)** □ A little 48 (7.3%) □ Some 44 (6.7%) □ A lot 15 (2.3%)	□ **None 485 (83.5%)** □ A little 39 (6.7%) □ Some 36 (6.2%) □ A lot 21 (3.6%)
Non-profit wildlife group NOT related to hunted species (e.g., Audubon) *n=659, n=582*	□ **None 551 (83.6%)** □ A little 52 (7.9%) □ Some 42 (6.4%) □ A lot 14 (2.1%)	□ **None 481 (82.6%)** □ A little 54 (9.3%) □ Some 30 (5.2%) □ A lot 17 (2.9%)
Friends/family members *n=658, n=589*	□ **None 246 (37.4%)** □ A little 196 (29.8%) □ Some 165 (25.1%) □ A lot 51 (7.8%)	□ **None 232 (39.4%)** □ A little 162 (27.5%) □ Some 150 (25.5%) □ A lot 45 (7.6%)
Other woodland owners *n=655, n=586*	□ **None 337 (51.5%)** □ A little 162 (24.7%) □ Some 136 (20.8%) □ A lot 20 (3.1%)	□ **None 312 (53.2%)** □ A little 131 (22.4%) □ Some 124(21.2%) □ A lot 19 (3.2%)

Other (_____) *n=27, n=25*	□ None 4 (14.8%) □ A little 1 (3.7%) □ Some 4 (14.8%) □ **A lot 18 (66.7%)**	□ None 2 (8.0%) □ A little 0 (0.0%) □ Some 4 (16.0%) □ **A lot 19 (76.0%)**

BACKGROUND INFORMATION

Small (10-49 acres) Landowner Responses

22. **Which wildlife or land organizations are you a member of?** *n=292*

- ☐ Audubon *22 (7.5%)*
- ☐ Cornell Lab of Ornithology *6 (2.1%)*
- ☐ Farm Bureau *13 (4.5%)*
- ☐ Local land trust (please specify _____) *5 (1.7%)*
- ☐ National Wild Turkey Federation *7 (2.4%)*
- ☐ National Wildlife Federation *19 (6.5%)*
- ☐ Master Forest Owner volunteers *0 (0.0%)*
- ☐ New York Forest Owners Association *4 (1.4%)*
- ☐ Pheasants Forever *3 (1.0%)*
- ☐ Quality Deer Management Association *5 (1.5%)*
- ☐ Ruffed Grouse Society 4 *(1.4%)*
- ☐ The Nature Conservancy ***24 (8.2%)***
- ☐ Other (please specify _____) *23 (7.9%)*
- ☐ **NONE *205 (70.2%)***

23. **Are you male or female?** *(Check one) n=335* ☐ **Male *262 (78.2%)*** ☐ Female 73 *(21.8%)*

24. **In what year were you born?** *n=328* 19_____ *M=50.80, Mdn=51*

25. **Is your primary residence:** *(Check one) n=334* ☐ Urban *34 (9.9%)* ☐ Suburban 83 *(24.9%)* ☐ **Rural *217 (65.0%)***

26. **What is the highest level of formal education you have completed?** *(Check one)n=335*

- ☐ Less than high school *5 (1.5%)*
- ☐ High school diploma/G.E.D. 79 *(23.6%)*
- ☐ **Some college or technical school *84 (25.1%)***
- ☐ Associate's degree *38 (11.3%)*
- ☐ College undergraduate degree (e.g., B.A., B.S.) *61 (18.2%)*
- ☐ Graduate or professional degree (e.g., M.S., Ph.D., M.D.) *68 (20.3%)*

If you would be interested in further communication about wildlife habitat programs for landowners and/or opportunities for contributing your thoughts further as part of a discussion group, please provide your contact information here. (Including your name here will NOT compromise the confidentiality of your other responses. It will be kept in a separate list).

Send me information about: *n=337*

☐ programs for landowners. *198 (58.8%)* ☐ participating in a discussion group. *22 (6.5%)*

BACKGROUND INFORMATION

Large (50 or more acres) Landowner Responses

22. **Which wildlife or land organizations are you a member of?** *n=622*

- ☐ Audubon *30 (4.8%)*
- ☐ Cornell Lab of Ornithology *19 (3.1%)*
- ☐ **Farm Bureau *124 (19.9%)***
- ☐ Local land trust (please specify _____) *13 (2.1%)*
- ☐ National Wild Turkey Federation *44 (7.1%)*
- ☐ National Wildlife Federation *33 (5.3%)*
- ☐ Master Forest Owner volunteers *4 (0.6%)*
- ☐ New York Forest Owners Association *42 (6.8%)*
- ☐ Pheasants Forever *13 (2.1%)*
- ☐ Quality Deer Management Association *39 (6.3%)*
- ☐ Ruffed Grouse Society *12 (1.9%)*
- ☐ The Nature Conservancy *31 (5.0%)*
- ☐ Other (please specify _____) *59 (9.5%)*
- ☐ NONE ***354 (56.9%)***

23. **Are you male or female?** *(Check one) n=674* ☐ **Male *568 (84.3%)*** ☐ Female *106 (15.7%)*

24. **In what year were you born?** *n=667* 19_____ *M=48.99, Mdn=49*

25. **Is your primary residence:** *(Check one) n=674* ☐ Urban *58 (8.6%)* ☐ Suburban *109 (16.2%)* ☐ **Rural *507 (75.2%)***

26. **What is the highest level of formal education you have completed?** *(Check one)n=677*

- ☐ Less than high school *21 (3.1%)*
- ☐ High school diploma/G.E.D. *155 (22.9%)*
- ☐ **Some college or technical school *160 (23.3%)***
- ☐ Associate's degree *90 (13.3%)*
- ☐ College undergraduate degree (e.g., B.A., B.S.) *125 (18.5%)*
- ☐ Graduate or professional degree (e.g., M.S., Ph.D., M.D.) *126 (18.6%)*

If you would be interested in further communication about wildlife habitat programs for landowners and/or opportunities for contributing your thoughts further as part of a discussion group, please provide your contact information here. (Including your name here will NOT compromise the confidentiality of your other responses. It will be kept in a separate list).

Send me information about: *n=682*

☐ programs for landowners. *442 (64.8%)* ☐ participating in a discussion group. *96 (14.1%)*

APPENDIX B. INSTRUMENTS

Expert Interview Instrument
Landowner Interview Instrument
Landowner Focus Group Instrument
Landowner Mail Survey Instrument

Expert Interview Instrument

What work do you with forest management, research, or outreach?
How would you define early successional habitat (ESH)?
Specifically, how does your job involve work with ESH?
What have you seen work in creating/restoring ESH?
What has not worked in creating/restoring ESH?
What are the optimal characteristics of ESH for wildlife?
What challenges are there to ESH restoration and conservation?
What risks (perceived or actual) are there for landowners in ESH restoration and conservation?
What human dimensions research do you think would be useful?
How do you think it would be best to find landowners for our research?
What outreach products have you created/seen for landowners? Do you have copies I could get?
Who else would you recommend I speak with?

Landowner Interview Instrument

I'm interested in learning a little bit more about the background of the land you own and how you came to own it….

Ownership history: How did you get your woodland parcel? How long have you owned it? Do you own it with any one else?

Characteristics of woodlands: How large is your woodland parcel? About what percentage of your parcel is wooded? How would you describe your woodlands?

Familiarity with woodlot: How close do you live to your woodland parcel (in miles)? How much time do you spend there?

Goals and priorities: What are your goals and priorities on your woodlot?

Programs on woodlot: Have you ever considered incentive programs or easements for your property? Why/why not?

Recreation: What types of outdoor recreation do you enjoy on your woodland? Elsewhere?

Wildlife: What types of wildlife do you have on your property? Which do you most prefer and why? Why do you think they are there?

Wildlife changes: Have you seen the amount or number of wildlife change on your property over time? Why? *How have you noted the changes? Which wildlife?*

I understand that you have managed your property for early successional habitat (ESH; or that land with grasses, shrubs, bushes, and small trees).

Story of ESH: I am interested to hear the story of how this came about. Can you share that with me?

Definition of ESH: When I say early successional habitat, what comes to mind? Are you thinking about any wildlife species in particular? Any plant species in particular? Any treatments in particular?

Activities of ESH: What work did you have to undertake to manage the ESH?

Motivations for ESH: Tell me more about why you wanted this on your land and what you are trying to achieve with ESH.

Source of Info for ESH: Tell me about how you heard of this type of management. Who convinced you to undertake it? What about their information convinced you? How had you felt about it previously?

Support for ESH: Did you have any conversations or support from foresters or wildlife biologists? Who did they work for? What type of support did they provide?

Ease of ESH: Was managing for ESH challenging?

Success of ESH: Tell me about how you feel about how it turned out and how the results compared to what you expected. *What did you look for to decide if it was successful? Did you notice any changes in wildlife (which?)? How was this different/same as what you expected?*

Tell me about how it could've gone better.

Tell me about changes you have noticed on your land as a result of this management.

Support of agency to ease: Tell me about what was difficult. What could a management agency do to make it easier or more desirable for you to do more of this work in the future?

Future plans for ESH: Tell me about your future plans along these lines. Would you do more ESH management? Why? Why not?

Norms and ESH: Do you have a sense of what others think about your management for ESH? Have friends, family, or neighbors commented on what you have done?

Coordination on ESH: Have you ever coordinated with your neighbors on land management? How?

Other Landowners and ESH: Do you have any thoughts on why more landowners aren't doing similar work on their land?

Comparison to other activities: What other types of land management have you conducted (including harvesting or removing trees)? Why? How did it compare?

Anything else to add…

Landowner Focus Group Instrument

Welcome/Introduction

Good afternoon. My name is Ashley Dayer. I am a graduate student at Cornell University. Assisting me is (insert name) who is also from Cornell University. Thanks for coming to our session today. As we mentioned in our email communications with you, Cornell University is conducting a study of private woodlands management for wildlife, particularly early successional forest habitat. We are asking you to take part because you are a woodland owner in the New York State. The interview and a short follow-up survey at the close of our session will include questions about your woodland, your experiences with and thoughts about land management, your familiarity with early successional habitat management practices, and your interests in managing for wildlife on your land.

In the process of the focus group we will ask some open-ended questions. It will be of benefit to us to use an audio-recorder, so that we can listen to the discussion and transcribe the full details later. As we mentioned in our email, it is your right to opt out of being recorded. Participation in this interview is voluntary and anonymous. The names of the participants and their identifying characteristics will not be linked with any specific comments provided as part of this study. If you would like a copy of the study report, we would be pleased to send it to you upon request. The session today will last for about an hour and 15 minutes, followed by a short survey that will take you less than 15 minutes. Before we begin, let's discuss our approach for today's session.

Guidelines

- There are no right or wrong answers. We want to know your opinions. This is not a quiz!
- I'll ask a question, and then we will go around the circle so that each person can give their response.
- Please feel free to share any ideas you have and be honest.
- Please be respectful of the thoughts and opinions of others.
- Please turn off your cell phones.
- If you need to leave, please let my assistant know. We do hope that all of you will be able to stay for the entire session.

Opening

First, let's go around the circle so that everyone can tell us your name and where in the state you are from.

Now we will begin our discussion.

Question Guide

1. How do you see private woodlands contributing to wildlife conservation in the state?
    - In what ways?
    - How does this compare to public lands?

2. What types of activities do you think it takes for wildlife conservation to be effective in a private landowner's woods?

3. Have you undertaken any of these activities in your woods? Why or why not?

4. Are there other activities that you undertake in your woods that you do NOT see as part of wildlife conservation?

5. What would encourage or discourage landowners from undertaking these activities for conservation?

6. What could an agency or organization do to aid landowners in undertaking activities for wildlife conservation in their forests?

7. Have you ever heard of early successional forest habitat?

    - If so, what have you heard about it?
    - Could you define it?

8. Has anyone considered managing for ESH on their land? Why? Why not?

9. How do you receive your information about forests and wildlife conservation activities?

    - Which sources do you trust?
    - Do you like how you receive information or would you prefer a different means?
    - Have you ever interacted with wildlife biologists? If so, what might they help you with?

10. Lastly, we are interested in how you would envision your ideal land to own for wildlife habitat in the southern tier of New York. On this 8X11 sheet of paper we are passing around, we'd like you to map (or sketch and label) how you'd envision that land. You can either work on this now or take one of these self-addressed and stamped envelopes to work on your map at home and mail it back to me. As with all of our previous questions, there is no right or wrong answer. We're interested in your thoughts and ideas as a landowner in the southern tier.

Wildlife Habitat in New York's Southern Tier: A Survey of Landowners

Cornell University
Human Dimensions Research Unit

Artwork by Megan Gnekow

The purpose of this survey is to learn more about why you own land, your activities on your land, and the kinds of wildlife habitat you want on your land. Even if you aren't very interested in wildlife, we still would like you to answer the questions and return the questionnaire so the results better represent *all* landowners in the Southern Tier. Results from the survey will be helpful in preparing educational materials, services, and programs that will benefit landowners in your area.

In this questionnaire, **wildlife** means all types of wild animals that are not domesticated, including reptiles, amphibians, birds, and mammals. **Management** means taking actions on your land to influence trees and other plant cover, or wildlife. Some **examples of management activities** are harvesting firewood or timber, making a trail, mowing a field, planting a food plot, putting up nest boxes, or improving habitat for wildlife.

Please complete this questionnaire as soon as you can, place it in the envelope provided, and drop it in any mailbox; return postage has been covered.

Your participation in this survey is voluntary, but we encourage you to respond. Hearing back from as many people as possible will ensure that the results of the survey are valid and adequately represent the perspectives of landowners. Please be assured that your identity will be kept strictly confidential and your responses will never be associated with your name.

THANK YOU FOR YOUR HELP!

This survey is a cooperative effort of the
New York State Department of Environmental Conservation,
Cornell University Department of Natural Resources
Human Dimensions Research Unit, and
Cornell Cooperative Extension.

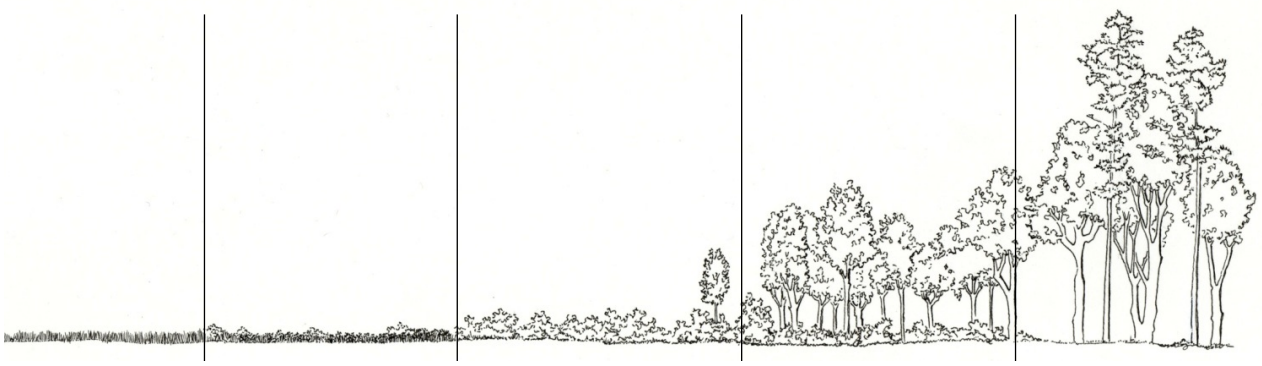
1. **What are the characteristics of the parcel(s) of land you own in the Southern Tier of New York State?** The Southern Tier includes Chautauqua, Cattaraugus, Allegany, Steuben, Schuyler, Chemung, Tompkins, Cortland, Tioga, Broome, Chenango, Otsego, and Delaware counties. *(Complete one row for each parcel of land you own.)*

Parcel in Southern Tier	How many acres?	How many years owned?	How far do you live (miles) from the parcel?
1			
2			
3			
4			
5			

2. **About how many acres of each of the following types of land do you own <u>in the Southern Tier</u>?** (*Note: a picture of the land types is below.*)

Land types	**About how many acres owned?** *(write a number in each box)*
Residential (lawn, gardens, buildings, paved)	
Agricultural (crop fields, Christmas trees, hay fields mowed more than once annually)	
Grassland or field regularly mowed every 1-3 years	
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush)	
Shrubland (more than 25% brush)	
Young forest (most trees with trunks less than 4" in diameter)	
Mature forest	
Other (please specify) _____	

Grassland | Fallow field regenerating | Shrubland | Young forest | Mature forest



3. **How would you like your land to change in the future?** Refer back to Question 4 to compare what you want in the future with the amount you currently have. *(Check one box for each row.)*

Land types	**Compared to now, I'd like my land to have…**
Residential (lawn, gardens, buildings, paved)	□Less □Same □More
Agricultural (crop fields, Christmas trees, hay fields mowed more than once annually)	□Less □Same □More
Grassland or field regularly mowed every 1-3 years	□Less □Same □More
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush)	□Less □Same □More
Shrubland (more than 25% brush)	□Less □Same □More
Young forest (most trees with trunks less than 4" in diameter)	□Less □Same □More
Mature forest	□Less □Same □More
Other (please specify) _____	□Less □Same □More

4. **Would you say your general attitude toward each of these land types is positive, negative, or neutral?** *(Check one box for each row.)*

Activities	**Very Negative**	**Negative**	**Neither**	**Positive**	**Very Positive**
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush)	□	□	□	□	□
Shrubland (more than 25% brush)	□	□	□	□	□
Young forest (most trees with trunks less than 4" in diameter)	□	□	□	□	□
Mature forest	□	□	□	□	□

5. **How necessary or unnecessary do you believe the following types of land are for wildlife conservation?** *(Check one box for each row.)*

Activities	**Very Unnecessary**	**Unnecessary**	**Neither**	**Necessary**	**Very Necessary**
Fallow fields that have not been grazed, mowed, or planted in more than 3 years (less than 25% brush)	□	□	□	□	□
Shrubland (more than 25% brush)	□	□	□	□	□
Young forest (most trees with trunks less than 4" in diameter)	□	□	□	□	□
Mature forest	□	□	□	□	□

6. **To what extent do you agree or disagree with each of the following statements about your land?** (*Check one box for each row.)*

Thoughts about your land	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
It is my favorite place to be.	☐	☐	☐	☐	☐
For the things I enjoy most, no other place can compare.	☐	☐	☐	☐	☐
Everything about it is a reflection of me.	☐	☐	☐	☐	☐
I feel happiest when I am there.	☐	☐	☐	☐	☐
It is the best place to do the things I enjoy.	☐	☐	☐	☐	☐
I feel that I can really be myself there.	☐	☐	☐	☐	☐

7. **People own land for many reasons. How important are the following as reasons for why you own your land in the Southern Tier?** (*Check one box for each row.)*

Reasons you own your land	Not at all important	Slightly important	Moderately important	Very important
To enjoy the scenery	☐	☐	☐	☐
To protect nature	☐	☐	☐	☐
To provide a place for wildlife to live	☐	☐	☐	☐
For land investment (e.g., sale in the future)	☐	☐	☐	☐
For privacy	☐	☐	☐	☐
To pass land on to my heirs	☐	☐	☐	☐
For production of timber products for sale	☐	☐	☐	☐
For production of timber products for my family's use	☐	☐	☐	☐
For non-timber forest products (e.g., maple syrup)	☐	☐	☐	☐
For farming	☐	☐	☐	☐
For hunting or fishing	☐	☐	☐	☐
For birding or birdwatching	☐	☐	☐	☐
For recreation that isn't wildlife related	☐	☐	☐	☐
Other (please specify):	☐	☐	☐	☐

8. **We're interested in knowing your views about the management of land and wildlife (as we define on the inside front cover). To what extent do you agree or disagree with each of the following?** (*Check one box for each row.)*

Views about land and wildlife	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Land should be managed so that people benefit.	☐	☐	☐	☐	☐
Trees and plants have value, regardless of people's uses for them.	☐	☐	☐	☐	☐
People's needs should take priority over conservation of the land.	☐	☐	☐	☐	☐
Land, and the plants and trees on it, should be left to exist naturally without being managed by people.	☐	☐	☐	☐	☐
Wildlife should be managed so that people benefit.	☐	☐	☐	☐	☐
Wildlife have value, regardless of people's uses for them.	☐	☐	☐	☐	☐
People's needs should take priority over conservation of wildlife.	☐	☐	☐	☐	☐
Wildlife should be left to exist naturally without being managed by people.	☐	☐	☐	☐	☐
Wildlife benefits from management by people.	☐	☐	☐	☐	☐
Land benefits from management by people.	☐	☐	☐	☐	☐
To benefit wildlife, land is best left untouched.	☐	☐	☐	☐	☐
Generally, cutting trees on the land is good for wildlife.	☐	☐	☐	☐	☐

9. **The following are activities some landowners might do (or have others do for them) on their land. Which of these have you done in the last 10 years, and which are you likely to do in the next 5 years?** *(Check one box in each row and column.)*

Activities	Have you done this activity in the last 10 years?	How likely are you to do the activity in the next 5 years?
Cut a patch of trees (at least ½ acre) where all or most of the trees were removed (to open the canopy) and plants and trees were allowed to grow back	□ Yes □ No □ I do not own land with woods.	□ Not at all □ Slightly □ Moderately □ Very
Cut single trees scattered throughout all or a part of your woodland	□ Yes □ No □ I do not own land with woods.	□ Not at all □ Slightly □ Moderately □ Very

10. **How bad or good do you believe these activities are for <u>your land</u>?** *(Check one box for each row.)*

Activities	Very Bad	Bad	Neither	Good	Very Good
Cutting a patch of trees (at least ½ acre)	☐	☐	☐	☐	☐
Cutting single trees scattered throughout the woods	☐	☐	☐	☐	☐

11. **How bad or good do you believe these activities are for <u>wildlife</u>?** (*Check one box for each row.)*

Activities	Very Bad	Bad	Neither	Good	Very Good
Cutting a patch of trees (at least ½ acre)	☐	☐	☐	☐	☐
Cutting single trees scattered throughout the woods	☐	☐	☐	☐	☐

12. **How common is it that other landowners in your area do these activities?** (*Check one choice for each row.)*

Activities	Not at all Common	Slightly Common	Moderately Common	Very Common	Don't Know
Cutting a patch of trees (at least ½ acre)	☐	☐	☐	☐	☐
Cutting single trees scattered throughout the woods	☐	☐	☐	☐	☐

13. **When it comes to the activities you do on your land, how important to you are the opinions of each of the following groups?** (*Check one box for row.)*

Groups of people	Not at all Important	Slightly Important	Moderately Important	Very Important
My family	☐	☐	☐	☐
My friends	☐	☐	☐	☐
Nearby landowners	☐	☐	☐	☐
Forest professionals	☐	☐	☐	☐
Wildlife professionals	☐	☐	☐	☐

14. **How bad or good do these groups of people think <u>cutting a patch of trees (at least ½ acre) where all or most of the trees were removed</u> would be for your land?** (*Check one box for each row.)*

Groups of people	Very Bad	Bad	Neither	Good	Very Good	Don't Know
My family	☐	☐	☐	☐	☐	☐
My friends	☐	☐	☐	☐	☐	☐
Nearby landowners	☐	☐	☐	☐	☐	☐
Forest professionals	☐	☐	☐	☐	☐	☐
Wildlife professionals	☐	☐	☐	☐	☐	☐

15. **How bad or good do these groups of people think <u>cutting single trees scattered throughout all or a part of your woodland</u> would be for your land?** (*Check one box for each row.)*

Groups of people	Very Bad	Bad	Neither	Good	Very Good	Don't Know
My family	☐	☐	☐	☐	☐	☐
My friends	☐	☐	☐	☐	☐	☐
Nearby landowners	☐	☐	☐	☐	☐	☐
Forest professionals	☐	☐	☐	☐	☐	☐
Wildlife professionals	☐	☐	☐	☐	☐	☐

16. **To what extent do you feel you are able to get the following activities done on your land (if you decide to do so)?** (*Check one box for each row.)*

Activities	Not at all Able	Slightly Able	Moderately Able	Very Able
Cutting a patch of trees (at least ½ acre)	☐	☐	☐	☐
Cutting single trees scattered throughout the woods	☐	☐	☐	☐

17. **Do you agree or disagree that the following action would benefit wildlife in the following areas?** (*Check one box for each row.)*

Cutting <u>a patch of trees (at least ½ acre)</u> on my land would benefit wildlife….	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	Don't Know
on my property.	☐	☐	☐	☐	☐	☐
on properties neighboring mine.	☐	☐	☐	☐	☐	☐
in my local area.	☐	☐	☐	☐	☐	☐

18. Do you agree or disagree that the following action would benefit wildlife in the following areas? (*Check one box for each row.)*

Cutting single trees scattered throughout the woods on my land would benefit wildlife….	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**	**Don't Know**
on my property.	☐	☐	☐	☐	☐	☐
on properties neighboring mine.	☐	☐	☐	☐	☐	☐
in my local area.	☐	☐	☐	☐	☐	☐

19. Do you agree or disagree that the extent to which you cut on your land is limited by the following factors? *(Check one box for each row.)*

Factors	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**
I don't have enough time.	☐	☐	☐	☐	☐
I don't have enough money.	☐	☐	☐	☐	☐
I don't have a market for products.	☐	☐	☐	☐	☐
I don't have enough knowledge about how and where to cut.	☐	☐	☐	☐	☐
I don't have enough knowledge about why to cut.	☐	☐	☐	☐	☐
I don't have someone skilled enough to do the work.	☐	☐	☐	☐	☐
I don't have adequate equipment or tools to do the work.	☐	☐	☐	☐	☐
I don't have enough support from foresters.	☐	☐	☐	☐	☐
I don't have enough support from wildlife biologists.	☐	☐	☐	☐	☐
I don't have supportive state and local regulations.	☐	☐	☐	☐	☐
I don't have enough acreage.	☐	☐	☐	☐	☐
I don't think it is the right thing to do.	☐	☐	☐	☐	☐
I don't like the look of it.	☐	☐	☐	☐	☐
Other (please specify _____)	☐	☐	☐	☐	☐

20. To what extent would any of the following conditions increase your willingness to <u>cut more patches of trees (at least ½ acre)</u> on your land than you do now? *(Check one box for each row.)*

Would your willingness increase if you…	Not Increase	Slightly Increase	Moderately Increase	Greatly Increase
received financial assistance or tax reduction?	□	□	□	□
found a market for the cut wood?	□	□	□	□
received advice by an expert on the activity?	□	□	□	□
had a plan for your land that called for such cuts?	□	□	□	□
could borrow free equipment?	□	□	□	□
could receive labor to conduct the activity?	□	□	□	□
learned that the activity benefits wildlife?	□	□	□	□
learned that the activity benefits rare wildlife?	□	□	□	□
found more people doing it in your area?	□	□	□	□
found that very few people were doing it in your area?	□	□	□	□
earned recognition from the state agency or a non-profit?	□	□	□	□
owned more land?	□	□	□	□

21. From which of these sources have you heard or read about land management for wildlife <u>and</u> how much have the sources influenced your beliefs? *(Check one box in each row and column.)*

Information sources about management for wildlife	How much have you heard or read from this source?	How much has this source influenced you?
NY Department of Environmental Conservation	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Soil and Water Conservation District or Natural Resource Conservation Service	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Cornell Cooperative Extension	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Master Forest Owner volunteer	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Forest owner association (e.g., NY Forest Owners Association)	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Private/consulting foresters	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Private/consulting wildlife biologists	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Non-profit wildlife group related to hunted species (e.g., Ruffed Grouse Society)	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Non-profit wildlife group NOT related to hunted species (e.g., Audubon)	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Friends/family members	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Other woodland owners	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot
Other (_____)	□ None □ A little □ Some □ A lot	□ None □ A little □ Some □ A lot

BACKGROUND INFORMATION

22. **Which wildlife or land organizations are you a member of?**

- ☐ Audubon
- ☐ Cornell Lab of Ornithology
- ☐ Farm Bureau
- ☐ Local land trust (please specify _____)
- ☐ National Wild Turkey Federation
- ☐ National Wildlife Federation
- ☐ Master Forest Owner volunteers
- ☐ New York Forest Owners Association
- ☐ Pheasants Forever
- ☐ Quality Deer Management Association
- ☐ Ruffed Grouse Society
- ☐ The Nature Conservancy
- ☐ Other (please specify _____)
- ☐ NONE

23. **Are you male or female?** *(Check one)* ☐ Male ☐ Female

24. **In what year were you born?** 19_____

25. **Is your primary residence:** *(Check one)* ☐ Urban ☐ Suburban ☐ Rural

26. **What is the highest level of formal education you have completed?** *(Check one)*

- ☐ Less than high school
- ☐ High school diploma/G.E.D.
- ☐ Some college or technical school
- ☐ Associate's degree
- ☐ College undergraduate degree (e.g., B.A., B.S.)
- ☐ Graduate or professional degree (e.g., M.S., Ph.D., M.D.)

If you would be interested in further communication about wildlife habitat programs for landowners and/or opportunities for contributing your thoughts further as part of a discussion group, please provide your contact information here. (Including your name here will NOT compromise the confidentiality of your other responses. It will be kept in a separate list).

Send me information about:

☐ programs for landowners. ☐ participating in a discussion group.

Name: _____

Email: _____

Mailing Address: _____

_____

Thank you for your time and effort!

To return this questionnaire, place it in the envelope provided, and drop it in the mail (return postage has been covered).

Please use this back page for any additional comments you wish to make.